

Rhodora

JOURNAL OF THE
NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS } Associate Editors

Vol 42.

March, 1940.

No. 495.

CONTENTS:

Spergularia in North and South America..	<i>Ruth P. Rossbach</i>	57
Cyperus polystachyos var. filicinus.	<i>Hugh O'Neill</i>	84
Further Notes on Coastal Plain Elements in the Bogs of Augusta County, Virginia.	<i>Lloyd G. Carr</i>	86
Pensylvanicus or pennsylvanicus?	<i>M. L. Fernald</i>	94
Potamogeton Hillii in Berkshire County, Massachusetts.		
<i>William A. Weber</i>		95
Rafinesque Types in the Group of Acalypha virginica.		
<i>C. A. Weatherby</i>		96

The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Room 1001, 53 State St., Boston, Mass.

RHODORA.—A monthly journal of botany, devoted primarily to the flora of New England. Price, \$2.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) 20 cents. Volumes 1-8 or some single numbers from them can be supplied only at advanced prices which will be furnished on application. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Forms will be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 25 copies of the issue in which their contributions appear. Extracted reprints, if ordered in advance, will be furnished at cost.

Address manuscripts and proofs to

M. L. Fernald, 14 Hawthorn Street, Cambridge, Mass.

Subscriptions (making *all* remittances payable to RHODORA) to

Ludlow Griscom, 8 W. King St., Lancaster, Pa., or Museum of Comparative Zoology, Cambridge, Mass.

Entered at Lancaster, Pa., Post Office as Second Class Mail Matter.

INTELLIGENCER PRINTING COMPANY
Specialists in Scientific and Technical Publications
EIGHT WEST KING ST., LANCASTER, PA.

CARD-INDEX OF NEW GENERA, SPECIES AND VARIETIES OF AMERICAN PLANTS, 1885 TO DATE.

For American taxonomists and all students of American plants the most important supplement to the Index Kewensis, this catalogue in several ways exceeds the latter work in detail, since it lists not only the flowering plants, but ferns and other vascular cryptogams, and includes not merely genera and species, but likewise subspecies, varieties and forms. A work of reference invaluable for larger herbaria, leading libraries, academies of sciences, and other centers of botanical activity. Issued quarterly, at \$22.50 per 1000 cards.

GRAY HERBARIUM of Harvard University,

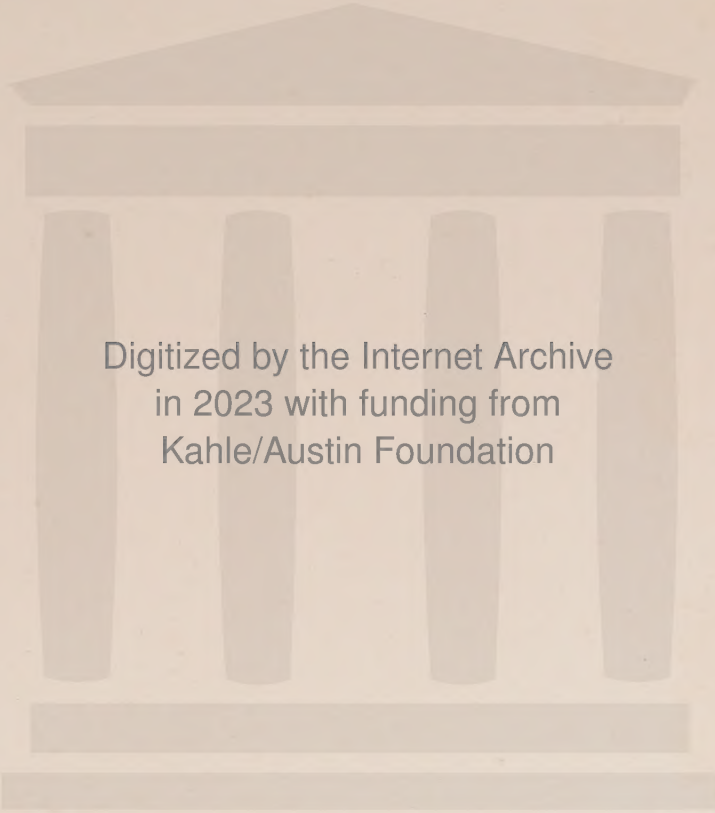
Cambridge, Mass., U. S. A.

MEMOIRS OF THE GRAY HERBARIUM. A series of illustrated quarto papers issued at irregular intervals, sold separately.

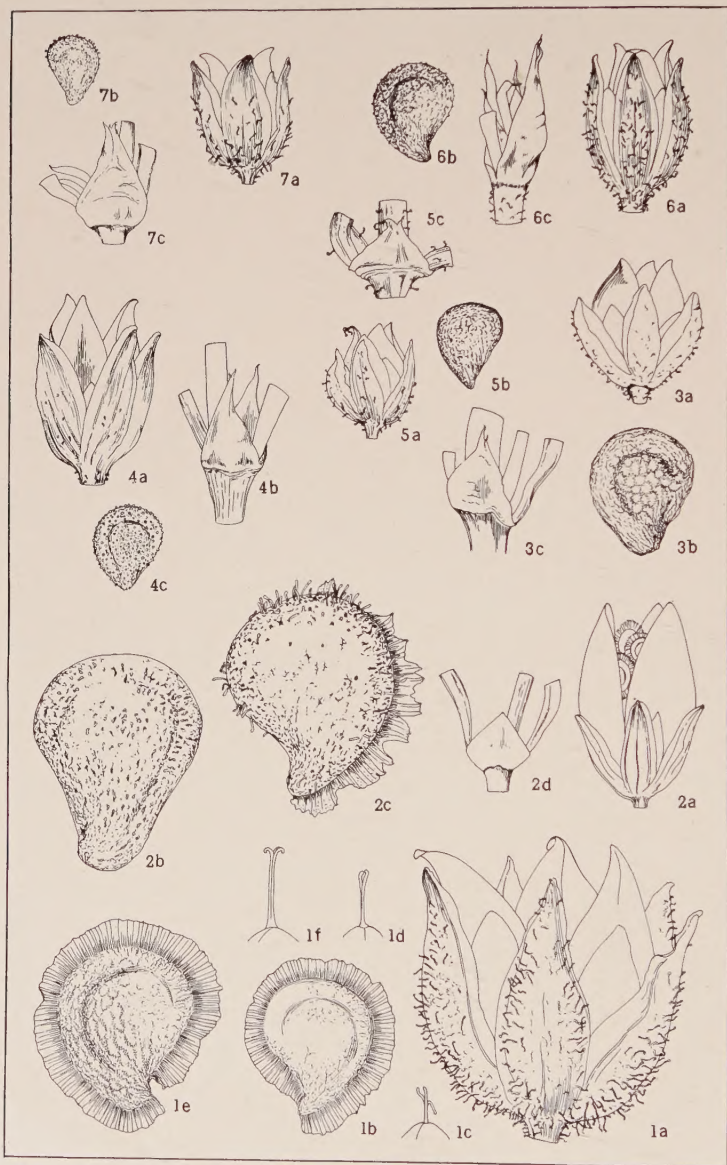
No. III. The Linear-leaved North American Species of Potamogeton, Section Axillares, by M. L. Fernald. 183 pp., 40 plates, 31 maps. 1932. \$3.00.

No. IV. The Myrtaceous Genus Syzygium Gaertner in Borneo, by E. D. Merrill and L. M. Perry. 68 pp. 1939. \$1.50.

Gray Herbarium of Harvard University, Cambridge, Mass.



Digitized by the Internet Archive
in 2023 with funding from
Kahle/Austin Foundation



SPARGULARIA: stipule, calyx, capsule and styles $\times 5$; seeds $\times 25$.

S. MACROTHECA, figs. 1a-1c; var. *LEUCANTHA*, fig. 1d; var. *LONGISTYLA*, figs. 1e and 1f. *S. CANADENSIS*, figs. 2a-2d. *S. ATROSPERMA*, figs. 3a-3c. *S. MEXICANA*, figs. 4a-4c. *S. DIANDRA*, figs. 5a-5c. *S. RUBRA*, figs. 6a-6c. *S. BOCCONI*, figs. 7a-7c.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 42.

March, 1940.

No. 495.

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD
UNIVERSITY—NO. CXXXI

SPERGULARIA IN NORTH AND SOUTH AMERICA

RUTH P. ROSSBACH

(Plates 589–596)

INTRODUCTION

THE genus *Spergularia* (Pers.) J. & C. Presl¹ in North and South America includes forty species and varieties, five of which are introductions from other parts of the world. The genus reaches the height of its development in Chile where there are fourteen native species. Present collections of these indicate localized geographic distributions which, when studied in conjunction with the geology of the area and ecological conditions, should bring interesting results.

The genus was included in *Arenaria* by Linnaeus, Sp. Pl. (1753 & 1762) and Gen. Pl. ed. 5 (1754). Linnaeus also included one species of the genus under *Alsine*, Gen. Pl. ed. 5, 132 (1754). *Alsine* here included those species which are now known as *Stellaria media* and *Spergularia segetalis*; and *Stellaria media* is designated by the International Rules of Botanical Nomenclature as the type of *Alsine*. The first generic name used solely for the genus under discussion was *Tissa* Adans. Fam. ii. 507 (1763), which is immediately followed by another, *Buda* Adans. l. c., with no significant difference between the extremely cursory, tabular descriptions. In 1769, Mitchell, Princip. Bot. & Zool. App. Gen. Pl. 30, clearly separates the genus from *Arenaria* L.

¹ Fl. Čech. 94 (1819).

as *Corion*, giving a good description. *Corion*, in addition, has a pre-Linnaean basis in Mitchell, Act. Nat. Cur. viii. (1748). In 1805, Persoon, Synop. Pl. i. 504, used *Spergularia* as the name for a section or subgenus under *Arenaria*, and in 1819 J. & C. Presl, Fl. Čech. 94, raised this section to generic rank. *Spergularia* is a *nomen conservandum* according to the Internat. Rules Bot. Nom., revised by Internat. Bot. Congress of Cambridge, 1930, Appendix III, and therefore must be used instead of *Tissa* Adans. or *Buda* Adans, which for very good reasons have become *nomina rejicienda*. Of the many generic synonyms after *Spergularia* (Pers.) J. & C. Presl (1819), *Lepigonum* Wahlb. Fl. Gothob. 45 (1820), with its basis in section *Lepigonum* of *Arenaria* Fries, Fl. Hall. Add. 159 (1817), is the only one which has received extensive use.

No attempt will be made further to discuss the history of the various species of *Spergularia*; one glance at the extent of the synonymy in the following pages will show that a general statement would necessarily be too long and too involved to be of any value. It is sufficient to say that many combinations have been made under the various generic synonyms, many entities described upon superficial characters, such as habit and amount of pubescence, and species already recognized often badly confused. Few students of the genus have noted the variation within one entity, and many have entirely disregarded seeds. Since seeds offer the most important diagnostic character and the general habit is so similar, the confusion of many workers is easily explained.

It should be said, however, that the world monograph of *Lepigonum* by N. C. Kindberg (1863) deserves great praise. He clearly describes entities, giving exact measurements, and reveals careful examination of seeds. The illustrations are accurately and minutely done and, what is more remarkable for that early date, long synoptical treatments and careful citations of herbarium specimens are given. Much of the uncertainty evident in his treatment of American species is due to insufficient material.

In classifying *Spergularias* careful account, as already stated, should be taken of the seeds, size of mature capsule and its length in relation to sepals, type of inflorescence, size and quality of stipule, and type and degree of fasciculation of leaves. Many other characters serve as subordinate ones, such as number of stamens, length and degree of separation of styles, color of petals, and degree of pubescence.

The seeds of American *Spergularias* may vary in size from 0.35–1.4 mm. in length, *S. platensis* having the smallest, 0.35–0.4 mm., and *S. canadensis* the largest, 0.9–1.4 mm. The color of seeds varies from very light brown to red-brown, to dark brown, to black. Many species may have an iridescent or a silvery tinge in addition to the color. The surface of the seeds as seen by reflected light under the low power of a compound microscope may be smooth and dull in some species, as in *S. denticulata*, *S. marina*, *S. canadensis*, *S. media*, *S. macrotheca*, *S. ramosa*, *S. rupestris*, etc., or it may be very deeply sculptured in interwoven, vermiform pattern as in *S. rubra*, *S. atosperma*, *S. fasciculata*, *S. aberrans*, *S. levis*, *S. grandis*, etc., or it may sometimes be roughened but in no regular pattern, as in *S. Bocconi*, *S. platensis*, *S. pycnantha*, etc. Again, the surface may be highly lustrous, as in *S. stenocarpa* and *S. cremnophila*. There should be an explanation of my use of the term vermiform. This is used to denote closely meandering lines upon the surface, as though a minute worm went back and forth in first this direction, then in that in search of food, leaving his trail behind. I have been unable to find any better term for this type of marking. Sometimes the superficial lines are in crude circles, giving an areolar appearance, and sometimes they are crowded together and deeply cut, making elongate ridges over the surface. Occasionally they are visible merely as very delicate tracteries upon a smooth, dull surface, as in *S. villosa* or *S. macrotheca*. The type and presence of papillae are important, and these projections are, for convenience' sake, always considered as separate from the surface in the following treatment. The papillae may be nearly white and glandular to black and rigid and not glandular. They may be crowded upon the surface, giving an encrusted appearance, as in *S. andina*, *S. platensis* and *S. collina*, or they may be widely and regularly separated, as in *S. ramosa*, *S. rupestris*, or *S. marina*. Some species may always have papillae, as *S. rubra*, *S. andina*, *S. floribunda*, *S. collina*, *S. levis*, *S. pazensis* etc., while others never have papillae, as *S. media*, *S. macrotheca*, *S. arbuscula* and *S. denticulata*. There are many species, however, which may or may not have papillae, such as *S. marina*, *S. canadensis*, *S. platen-sis*, *S. ramosa*, *S. villosa*, *S. fasciculata*, *S. pycnantha* and *S. diandra*. Therefore, if papillae are present, it is important to examine them; if not, to note their absence; for these conditions in conjunction with other characteristics of the seed make it usually possible to identify the species by the seed alone. A characteristic of seeds long used and

often discounted by workers is the presence of a wing. The seeds of many species are never winged, in a few they are always winged, as far as known at present, but in a great many they may or may not be winged. However, if the wing is present, its margin, its color, and its width should be noted. These features may also, in addition to the surface, color, and size, lead one to positive identification.

In addition to seeds, the size of the mature capsules or, in a general way, the length of capsule compared to length of calyx may prove diagnostic. There are a few species in which the capsule is always shorter than the calyx and also a few in which it is always longer. However, there are a great many species in which the capsule may be slightly shorter than, equal to, or slightly longer than the calyx. The last cases show that the length of capsule, as compared to length of calyx, is at best a subordinate character.

In a few species the inflorescence may be short-noded and very crowded, as in *S. arbuscula*, *S. Cerviana*, *S. floribunda* and *S. pycnantha*. Other species may be much reduced in inflorescence, *i. e.* with only 1-3 flowers, as *S. andina*, *S. depauperata* and *S. Pissisi*. Many species may have lax, open, long inflorescences, as *S. grandis*, *S. pazensis*, *S. macrotheca*, *S. villosa* (sometimes), *S. stenocarpa* and *S. levis*. *S. congestifolia* is unique in having a minute-bracted inflorescence standing sharply differentiated, high above the crowded, leafy parts below. In many species, however, there is nothing striking about the inflorescence, which varies greatly in length of internodes and laxity.

In some species the stipules may be small and roughly deltoid, as in *S. canadensis*, *S. platensis*, *S. collina* and *S. ramosa* var. *diffusa*. Other species may have very large (as much as 8 mm. in length), lanceolate-acuminate stipules, as in *S. rupestris*, *S. levis*, *S. pazensis*, *S. ramosa*, *S. macrotheca*, *S. aberrans*, *S. pycnantha* and *S. villosa* (sometimes), although even these may sometimes have smaller stipules of around 5 mm. or less in length. In *S. congestifolia*, *S. arbuscula*, and usually in *S. fasciculata*, the stipules are strongly lacerate. All the remaining species have medium-sized, non-distinctive stipules which show a great variation in size. Indeed, every species is variable as to stipules to such an extent that their characters must always be considered subordinate.

The leaves of all *Spergularias* are linear and usually mucronate. In some species they are generally shorter than in others, though

there is usually great variation in length. Some species always have nearly filiform, relatively non-fleshy leaves, as in *S. rubra* and *S. congestifolia*; others have them extremely fleshy, as in *S. arbuscula*, and usually in *S. macrotheca*, while others may have less fleshy leaves, as in *S. fasciculata*. More important than fleshiness is degree of fasciculation, which reaches its height in *S. rubra*, *S. congestifolia*, *S. arbuscula*, *S. fasciculata*, *S. villosa* and *S. confertiflora*. Other species never have fascicled leaves, such as *S. canadensis*, *S. platensis* and *S. collina*. There are a great many species, however, in which the leaves are usually not fascicled but are sometimes slightly so.

It is evident from the above discussion that seed-differences are the most useful of diagnostic characters and that combinations of all other characteristics should supplement the study of seeds. However, it must be said that after long study of the many American species, one can become so well acquainted with them that new collections can quickly be sorted out almost without error without microscopic examination. This is due, I suppose, to the combinations of characters peculiar to each species.

ACKNOWLEDGMENTS

I wish to express deep gratitude to all the persons who have given me advice and information. Especially do I wish to thank Prof. M. L. Fernald, under whose patient guidance the investigation was carried on; also Mr. C. A. Weatherby for his many invaluable suggestions and his careful notes and photographs of types in European herbaria; and Dr. I. M. Johnston for the suggestion of the subject; also Miss Ruth D. Sanderson of the library of the Gray Herbarium for her untiring bibliographical assistance; and the remainder of the staff of the Gray Herbarium for their aid. I wish also especially to thank Sr. Marcial R. Espinosa, Curator at the Museo Nacional de Historia Natural, Santiago, Chile, for making available photographs and fragments of the Philippi types of Chilean species and for sending recent collections from Chile; and also Sr. Gualterio Looser for his interest and recent collections from Chile. I am very grateful to Dr. Eugene Simon of Tours, France, for his painstaking aid in bibliographical questions concerning the identification of many European species. I am also indebted to Prof. Johann Mattfeld of Berlin for invaluable bibliographical data and for a fragment of a type. For photographs of the St. Hilaire and Persoon types from South America

I am indebted to Prof. H. Humbert of the Muséum National d' Histoire Naturelle, Paris. To Mr. J. Ramsbottom, Keeper of Botany, British Museum, I am grateful for photographs of pertinent plants from the Clayton and Clifford Herbaria. I am indebted to Dr. S. J. v. Ooststroom, Assistant-in-chief, Rijksherbarium, Leiden, for data and a photograph of another type. Photographs of all types studied are deposited in the Gray Herbarium.

While completing my research at the Dudley Herbarium at Stanford University, California, I have been cordially given use of the library and collections and have been aided in many valuable ways by Prof. L. R. Abrams. I was also helped by many valuable suggestions from Dr. I. L. Wiggins. I wish further to express my gratitude to Dr. Hermann Knoche of San Jose, California, for the use of his library and herbarium of European plants, and to thank Miss Alice Eastwood and Mr. J. T. Howell of the California Academy of Sciences for their interest and coöperation. And especially do I owe many thanks to Mrs. George Neville Jones (Florence L. Freeman), formerly of the Arnold Arboretum, for invaluable bibliographical data not available in California.

To the following officials of herbaria I am deeply appreciative for loans of valuable collections: Dr. W. R. Maxon of the United States National Herbarium; Sir Arthur W. Hill, Director of the Royal Botanic Gardens, Kew; Dr. H. A. Gleason of the New York Botanical Garden; Mr. J. T. Howell of the California Academy of Sciences; Prof. Ludwig Diels, Director of the Botanical Museum at Berlin-Dahlem; Dr. A. L. Cabrera of the Museo de La Plata, Argentina; Dr. P. C. Standley of the Field Museum of Natural History; Prof. J. M. Fogg, Jr. of the University of Pennsylvania; Prof. L. G. M. Baas Becking and Dr. S. J. v. Ooststroom of the Rijksherbarium, Leiden; Prof. P. A. Munz of Pomona College; Dr. H. L. Mason of the University of California; Dr. L. E. Detling of the University of Oregon; Dr. C. L. Hitchcock of the Washington State Museum; Dr. R. M. Anderson and Mr. A. E. Porsild of the National Museum of Canada; Mr. W. A. Newcombe of Victoria, B. C.

The following symbols have been employed in the citation of specimens from the above herbaria: United States National Herbarium (U. S.); Royal Botanic Gardens, Kew (K.); New York Botanical Garden (N. Y.); California Academy of Sciences (Cal. Acad.); Botanical Museum at Berlin-Dahlem (B.); Museo de La Plata (La

Plata); Field Museum (F. M.); Herbarium of the University of Pennsylvania (Penn.); Rijksherbarium, Leiden (Leiden); Pomona College (Pom.); University of California (U. C.); University of Oregon (Ore.); Washington State Museum (W.); National Museum of Canada (Can.); W. A. Newcombe (Newcombe). Also the following herbaria are designated thus: Gray Herbarium (G.); Herbarium of New England Botanical Club (N. E. B. C.); Dudley Herbarium at Stanford University (D. S.); Muséum National d'Histoire Naturelle, Paris (Paris); Museo Nacional de Historia Natural, Santiago, Chile (Santiago); Herbarium, University of Notre Dame (Notre Dame).

SYNOPSIS OF SPERGULARIA IN NORTH AMERICA¹

- a. Plants perennial. b.
 - b. Seeds 0.7–0.9 mm. long, never papillose: styles 0.6–3 mm. long: sepals 5–10 mm. long: capsule robust. Styles 0.6–1.2 mm. long: petals pink or rosy. 1. *S. macrotheca*.
 Styles 1.2–3 mm. long: petals white.
 Styles 1.2–1.8 mm. long: capsule as much as 0.5–3 mm. longer than the calyx: seeds dark reddish-brown, always smooth. 2. *S. macrotheca*, var. *leucantha*.
 Styles 2–3 mm. long: capsule equal to or as much as 1 mm. shorter than the calyx: seeds usually nearly black and ordinarily silvery tinged, commonly deeply sculptured in interwoven, vermiform, areolar pattern. 3. *S. macrotheca*, var. *longistyla*.
 - b. Seeds 0.4–0.6 (rarely 0.65) mm. long, papillose or not: styles 0.2–0.6 mm. long: sepals 2–5 (rarely 5.2) mm. long: capsule more slender. c.
 - c. Leaves not fascicled (rarely with one small, leafy branch in the axil), glabrous: root fleshy (fibrous, farinaceous), often 1 cm. thick: styles 0.2–0.4 mm. long: petals 1.2–2.4 mm. long: sepals glabrous or with only sparse, short, glandular pubescence: seeds brown, rounded in outline, sculptured in interwoven vermiform pattern, densely covered with large, glandular papillae which are often cup-shaped, never winged. 4. *S. mexicana*.
 - c. Leaves densely fascicled, glandular-pubescent: root heavy, ligneous, not farinaceous: styles 0.4–0.6 mm. long: petals 2.6–5 mm. long: sepals densely glandular-pubescent: seeds very dark brown, nearly black, pyriform, not sculptured, covered with widely spaced, hard, black, non-glandular papillae or not papillose, surrounded by a white, scarious, erose wing or not winged. 29. *S. villosa*.
- a. Plants annuals or short-lived perennials. d.
 - d. Seeds black.
 Seeds 0.6–0.8 mm. long, rounded in outline, often with an iridescent tinge, sculptured in interwoven, areolar vermiform pattern, often deeply so: capsule as much as 0.6–1.4 mm. longer than the calyx: stipules 1.8–2.8 mm. long. 5. *S. atrosperma*.

¹ Measurements should be made to 0.1 mm. under a hand-lens and seeds should be examined under the low power of a compound microscope.

- Seeds 0.4–0.5 mm. long, pyriform, often with a silvery but not iridescent tinge, closely sculptured in interwoven, vermiform, but not areolar pattern: capsule equal to or as much as 0.5 mm. longer than the calyx: stipules 1–2 mm. long.....6. *S. diandra*.
- . Seeds brown.....e.
- e. Stamens 6–10....f.
- f. Seeds smooth, not papillose, usually surrounded by a wing, occasionally not winged, 0.6–1.1 mm., usually 0.8–1 mm. long: capsule large, usually 5.5–7 mm. long: large, robust plants, usually with fleshy leaves.....11. *S. media*.
- f. Seeds roughened or sculptured, always papillose, never winged, 0.4–0.6 mm. long: capsule smaller, 2.8–5.4 mm. long: plants more delicate, usually with less fleshy leaves.
- Leaves densely fascicled, filiform, scarcely fleshy: seeds dark brown, deeply sculptured in closely interwoven, vermiform pattern: stipules triangular-acuminate, conspicuous because of the large number of shining ones at a node, usually 3.5–5 mm. long.....7. *S. rubra*.
- Leaves not fascicled or only slightly so, more fleshy: seeds very light brown, surface reticulated or roughened in no regular pattern: stipules deltoid, dull white and scarcely acuminate, 2–4 mm. long.....8. *S. Bocconi*.
- e. Stamens 2–5....g.
- g. Seeds large, 0.9–1.4 (very rarely 0.8) mm. long, smooth or with irregular, reticulate thickenings, partially or entirely surrounded by a white, scarious, erose wing or not winged, sometimes with long, delicate, glandular pubescence, especially on the swollen rim at the summit.
- Prostrate or decumbent, always entirely glabrous except for the rarely sparsely glandular-pubescent pedicels: sepals always glabrous, blunt-tipped, 2.2–3.2 mm. long: mature capsule once-and-a-half to twice the length of the calyx....9. *S. canadensis*.
- Erect or nearly so, glabrous or glandular-pubescent throughout: sepals not blunt-tipped, 3–4.6 mm. long: mature capsule less than one-and-a-half times the length of the calyx...10. *S. canadensis*, var. *occidentalis*.
- g. Seeds 0.35–0.8 (very rarely 0.9) mm. long....h.
- h. Seeds 0.35–0.4 mm. long: inflorescence a much compounded cyme, glabrous throughout: sepals 0.8–1.6 mm. long: mature capsule 1.4–2.6 mm. long.....33. *S. platensis*.
- h. Seeds 0.5–0.8 (rarely 0.9) mm. long, glandular-papillose or not: inflorescence a lax, simple or only 1–2-times compounded cyme, sometimes glabrous but usually glandular-pubescent: sepals 1.6–5 mm. long: mature capsule 3–6.4 mm. long.
- Seeds silver-tinged, always roughened and often sculptured in irregular, vermiform pattern with irregular, short ridges between the sculptures: stipules shorter than broad, 1.4–2.4 mm. long: styles 0.3–0.4 mm. long.....14. *S. echinosperma*.

- Seeds dull, smooth or occasionally only slightly roughened by raised thickened areas: stipules as long as or longer than broad, 2-4 mm., usually 2.5-3 mm. long: styles 0.4-0.6 mm. long. Inflorescence a lax cyme, not crowded: sepals 2.4-5 mm. long: mature capsule 3.6-6.4 mm. long.....12. *S. marina*.
 Inflorescence crowded, with many flowers: stems highly branched: sepals usually shorter, 1.6-3.8 mm. long: mature capsule usually shorter, 3-4.4 mm. long.....13. *S. marina*, var. *tenuis*.

SYNOPSIS OF SPERGULARIA IN SOUTH AMERICA¹

- a. Stipules deeply lacerate, *i. e.* for one-third their length or more.....b.
 b. Inflorescence with much longer internodes than those of the stem, the inflorescence thus standing sharply differentiated high above the leafy lower parts: leaves short, filiform, falcate, densely fascicled: stipules lacerate for nearly two-thirds their length, giving the plant a silky appearance: fruiting pedicels long, the lowest 10-23 mm.: seeds unknown.....15. *S. congestifolia*
 b. Inflorescence with internodes not longer than those of stem, not sharply differentiated from the leafy parts below: leaves not falcate, filiform to very fleshy: stipules lacerate for one-half their length or less: fruiting pedicels usually shorter, often very short: seeds dark brown or black.
 Small shrub: inflorescence a compact cyme with crowded internodes: sepals glabrous or slightly glandular-pubescent at the base, 2.4-5 mm. long: petals 1.8-4 mm. long: styles 0.8-1.2 mm. long, separated to the base: mature capsule 1.6-3.6 mm. long: fruiting pedicels very short, the lowest 1-3 mm. long: seeds 0.6-0.8 mm. long, shining but never silvery, never winged..16. *S. arbuscula*.
 Perennial but not a shrub, *i. e.* herbaceous above the caudex: inflorescence a short, open cyme: sepals always glandular-pubescent, 5-10 mm. long: petals 4-10 mm. long: styles 1.5-2.5 mm. long, separating only partially, at the most 0.6 mm. from the apex: mature capsule 5-7 mm. long: fruiting pedicels 6-17 mm. long: seeds 0.8-1 mm. long, often with a silvery tinge, surrounded by a narrow, scarious wing or not winged.....17. *S. fasciculata*.
 a. Stipules very shortly or not at all lacerate at the apex.....c.
 c. Inflorescence with only 1-3 (rarely 4) flowers: plants with short internodes, usually forming low, thick mats....d.
 d. Sepals hooded at the apex: mature capsule 3-4 mm. long, exceeded by the calyx by as much as 0.5-1.2 mm.: fruiting pedicels very short, 0.5-2.5 mm. long: seeds brown, deeply sculptured and covered with large, glandular papillae which give them an encrusted appearance, 0.6-0.8 mm. long, not winged.....18. *S. andina*.
 d. Sepals blunt, not hooded, usually very fleshy: mature capsule 4.8-5.5 mm. long, equal to or but slightly exceeding the calyx, by as much as 0.5 mm.: fruiting

¹ Measurements should be made to 0.1 mm. with a hand-lens and seeds should be examined under the low power of a compound microscope.

pedicels 3-15 mm. long: seeds only delicately sculptured, 0.8-1 mm. long, always surrounded by a scarios wing.

Seeds light brown, surrounded by a broad wing so deeply lacerate as to form strap-like appendages 0.3-0.6 mm. long, covered with regularly spaced, glandular hairs branched at the tips: internodes of stem below the inflorescence without corky appearance: leaves filiform, not fleshy, usually 7-13 mm. long, 0.5 mm. broad: fruiting pedicels 6-15 mm. long.....19. *S. depauperata*.

Seeds dark brown, with a narrow, entire-margined wing 0.1 mm. wide, not papillose: internodes of stem below the inflorescence soft, with corky appearance: leaves linear, fleshy, 2-7 mm. long, 0.8-1 mm. broad: fruiting pedicels 3-5 mm. long.....20. *S. Pissisi*.

c. Inflorescence more than 3-4-flowered: plants lax and spreading, not forming thick mats.....e.

e. Seeds with broad, scarios wings 0.3-0.7 mm. wide and with nearly entire margins.....f.

f. Seeds light brown, not sculptured, smooth or covered with widely and regularly spaced brown papillae.

Central root not fleshy and starchy: styles 1-1.4 mm. long: leaves not spreading: stipules at least twice as long as broad, usually 3-5 mm. long: mature capsule equal to or slightly exceeding the calyx.....35. *S. ramosa*.

Central root fleshy and starchy, with a smooth, corky bark: styles 0.7-0.8 mm. long: leaves often spreading, giving a pseudoverticillate appearance: stipules usually shorter, almost deltoid, commonly 1.2-3 mm. long: mature capsule at least one-third longer than the calyx.....36. *S. ramosa*, var. *diffusa*.

f. Seeds dark, reddish brown or black, sculptured or not, papillose or not.

Seeds sculptured and with or without dark papillae.

Capsule 4-5-valved: styles 4-5: stems robust, 2-2.5 mm. in diameter.....38. *S. grandis*.

Capsule 3-valved: styles 3: stems 0.8-1.5 mm. in diameter.....39. *S. pazensis*.

Seeds not sculptured but smooth or with low, elongate mounds, never papillose.....11. *S. media*.

e. Seeds with wings less than 0.3 mm. wide or if so broad with erose margins, or not winged.....g.

g. Seeds brown, highly lustrous, smooth or only slightly sculptured.

Mature capsule slender, 3.2-4.8 mm. long: stamens 5: seeds 0.4-0.7 mm. long, not winged but sometimes with an extremely narrow, brown rim.23. *S. stenocarpa*.

Mature capsule robust, 5-6.6 mm. long: stamens 8-10: seeds 0.7-1.2 mm. long, surrounded by a hard, narrow, brown rim.....21. *S. cremnophila*.

g. Seeds not lustrous, smooth or deeply sculptured.....h.

h. Sepals mucronate: plant annual: seeds brown, smooth, dull, 0.5-0.6 mm. long.....24. *S. denticulata*.

h. Sepals not mucronate.....i.

i. Seeds black or dark brown, deeply sculptured in interwoven, vermiform pattern, 0.8-1 mm. long.....j.

- j.* Stamens 5: seeds dark, sepia-brown, surrounded by a narrow, brown, sculptured wing...22. *S. aberrans.*
- j.* Stamens 7-10....*k.*
- k.* Inflorescence a crowded, compound, many-flowered cyme, glabrous or only very sparsely pubescent: sepals glabrous, 2.6-4.5 mm. long: seeds covered with large, glandular papillae.....25. *S. Cerviana.*
- k.* Inflorescence an open, often lax cyme, densely glandular-pubescent: sepals densely glandular-pubescent, 5-10 mm. long. Inflorescence a short, open cyme, not lax: styles united for more than one-half their length: leaves densely fasciated, usually filiform.....17. *S. fasciculata.*
- Inflorescence a lax cyme: styles divided to the base or united only rarely for as much as one-half their length: leaves usually not so densely fasciated.
- Seeds brown, dull, with only occasional, small papillae: mature capsule 5-6.6 mm. long, equal to or as much as 2.4 mm. shorter than the calyx: leaves fleshy, 1-3 mm. wide.....21. *S. cremnophila.*
- Seeds very dark brown or black, glistening, nearly always covered with many, large, dark papillae: mature capsule usually much larger, 6.2-8.4 mm. long, equal to or up to 2 mm. longer than the calyx: leaves only 0.4-1 mm. wide.....39. *S. pazensis.*
- i.* Seeds light brown, or if dark brown or black less than 0.8 mm. long, or if 0.8-1 mm. long not sculptured and either light or dark brown....1.
- l.* Sepals very short, 0.8-1.6 mm. long: plant glabrous throughout, very slender, with a much compounded cyme: seeds 0.35-0.4 mm. long, sculptured and usually papillose.33. *S. platensis.*
- l.* Sepals longer, 2.2 mm. or more long....*m.*
- m.* Capsule spherical: seeds black, densely covered with papillae, 0.4-0.7 mm. long, not winged.....26. *S. floribunda.*
- m.* Capsule not spherical....*n.*
- n.* Seeds winged....*o.*
- o.* Seeds deeply sculptured in interwoven, vermiform pattern.
- Plant glabrous throughout: internodes 28-50 mm. long: leaves long, 22-80 mm.: capsule usually 6-8 mm. long, as much as 1.6-3.4 mm. longer than the calyx: fruiting pedicels glabrous, the lowest 7-20 mm. long: seeds deep reddish-brown, glandular-papillose, surrounded by a scarious, white, strongly erose wing.....37. *S. levis.*
- Plant glandular-pubescent at least in the inflorescence: internodes 6-20 mm. long: leaves 15-20 mm. long:

- capsule 5-5.2 mm. long, equaling or up to 1 mm. longer than the calyx: fruiting pedicels glandular-pubescent, the lowest 5-7 mm. long: mature seeds unknown 32. *S. colombiana*.
- o.* Seeds not sculptured.
Stamens 2-5..... 12. *S. marina*.
Stamens 7-10.
Seeds 0.4-0.6 (rarely 0.65) mm. long, pyriform, very dark brown or nearly black..... 29. *S. villosa*.
Seeds 0.7-1.1 mm. (very rarely 0.6 mm.) long, rounded in outline, light brown to dark brown.
Seeds light brown, covered with brown papillae, 0.7-0.8 mm. long: mature capsule equal to or as much as 0.8 mm. shorter than the calyx: sepals densely glandular-pubescent: styles 1-1.2 mm. long..... 40. *S. rupestris*.
Seeds dark brown, not papillose, 0.7-1.1 (rarely 0.6) mm. long: mature capsule usually 1-2.5 mm. longer than the calyx, rarely equaling it: sepals glabrous or only sparsely glandular-pubescent: styles 0.5-1 mm. long..... 11. *S. media*.
- n.* Seeds not winged.... *p.*
p. Stamens 6-10.... *q.*
q. Annual or sometimes a short-lived perennial.... *r.*
r. Seeds not sculptured but smooth or with low, elongate mounds, 0.7-1.1 (rarely 0.6) mm. long.... 11. *S. media*.
r. Seeds sculptured or irregularly roughened and papillose, 0.4-0.8 mm. long.
Seeds black, covered with long, large, black, glandular papillae: inflorescence widely angled: styles 0.8-1 mm. long.... 30. *S. collina*.
Seeds brown, with minute, small, brown papillae: inflorescence crowded or lax but not widely angled: styles 0.4-0.8 mm. long.
Leaves densely fascicled: stipules lanceolate-acuminate, shining, conspicuous because of their great number at an internode: styles 0.6-0.8 mm. long: seeds dark brown, not silvery, deeply sculptured in closely interwoven, vermiform pattern.... 7. *S. rubra*.
Leaves not fascicled or with only 1-2 minute leaves at the

- axil: stipules deltoid or nearly so, dull, inconspicuous: styles 0.4–0.6 mm. long: seeds light brown, often silver-tinged, surface reticulated and roughened but in no regular pattern.....8. *S. Bocconi*.
- q. Perennials.....s.
- s. Sepals glabrous but sometimes glandular-punctate.
Seeds light brown, not papillose, but often with minute, elongate ridges, 0.5–0.6 mm. long: sepals recurved but incurved at the apex, often hooded, usually minutely glandular-punctate, especially on the upper parts: inflorescence a lax cyme...31. *S. Spruceana*.
Seeds dark brown, covered with glandular papillae, 0.6–0.8 mm. long: sepals not recurved, nor hooded, nor glandular-punctate; inflorescence a compound cyme, usually crowded because of many capsules and short internodes.....25. *S. Cerviana*.
- s. Sepals glandular-pubescent.
Capsule longer than the calyx: seeds dark brown, nearly black, pyriform, not sculptured but with regularly spaced, black papillae or not papillose, and with very delicate, vermiform tracteries in areolar pattern, 0.4–0.6 (rarely 0.65) mm. long. 29. *S. villosa*.
Capsule equal to or as much as 0.8 mm. shorter than the calyx: seeds brown, rounded in outline, sculptured in interwoven, vermiform pattern, with large, elongate, slightly curved papillae (some seeds having in addition some round papillae), 0.6–0.7 mm. long.....28. *S. confertiflora*.
- p. Stamens 2–5.
Annual: the non-sculptured seeds covered with glandular papillae or not papillose, 0.6–0.8 mm. long. 12. *S. marina*.
Perennial: the sculptured seeds papillose or not, 0.3–0.5 mm. long.
Whole plant glabrous: sepals 2.2–2.8 mm. long: capsule as much as 1–1.2 mm. longer than the calyx: stipules deltoid, 1.2–1.6 mm. long: cyme simple, not crowded.
34. *S. platensis*, var. *Balansae*.
Whole plant densely glandular-pubescent: sepals 3.6–4.6 mm. long: capsule equal to or as much

as 0.8 mm. shorter than the calyx; stipules lanceolate-acuminate, 5–7 mm. long; cyme compound and usually crowded by many capsules and short upper internodes.

27. *S. pycnantha*.

1. *S. MACROTHECA* (Hornem.) Heynh. (PLATE 589, FIGS. 1a–1c and MAP 1). Perennial: *caudex* branched, becoming woody with age, bearing from 1– ∞ prostrate or semi-erect stems 3–45 cm. long; *internodes of stem below the inflorescence* glabrous or glandular-pubescent, 2–50 mm. long, 0.8–3 mm. in diameter; *leaves* fascicled or not, mucronate, fleshy, 0.6–3 mm. broad, 7–50 mm. long, glabrous to densely glandular-pubescent; *stipules conspicuous, triangular-acuminate*, 4–11 mm., usually 6–9 mm. long; *inflorescence* always glandular-pubescent throughout, lax with long internodes or crowded with short internodes but with the internodes becoming shorter toward the apex, the *lowest internodes* 3–35 mm. long, 0.8–1.4 mm. broad; *sepals* broadly lanceolate, *often attenuate*, glandular-pubescent, 5–10 mm., usually 6–9 mm. long; *petals* ovate, *rosy to light pink* and perhaps occasionally white,¹ 3.5–8, usually 4–6 mm. long, as much as 0.4–4 mm. shorter than calyx; *stamens* 10; *styles* 3, 0.6–1.2 mm. long, separated to base; *mature capsules* 5.5–10, usually 6–8 mm. long, 2 mm. shorter to 2 mm. longer than calyx; *fruiting pedicels* reflexed or not, the *lowest* 5–35 mm. long, 0.2–1, usually 0.6–0.8 mm. thick; *seeds* dark, reddish-brown, dull, nearly smooth or slightly huddled with low, rounded mounds, usually not sculptured or with only scarcely discernible verniform, areolar tracteries or occasionally very obvious channels upon the surface, 0.6–1 mm., usually 0.7–0.9 mm. long, *usually surrounded by a narrow, scarious, white or brownish, entire wing* 0.2 mm. or less wide, or by a still narrower, opaque, brown rim, occasionally not winged.—Heynh. Nom. ii. 689 (1846); Robins. in Proc. Am. Acad. xxix. 312 (1894); Robins. in Gray, Synop. Fl. N. Am. i. 252 (1897); Jepson, Fl. Calif. 493 (1914); Jepson, Man. Fl. Pl. Calif. 360 (1923); Munz, Fl. S. Calif. 164 (1935); Macbride, Field Mus. Nat. Hist. Pub. Bot. xiii.—Fl. Peru, pt. ii. no. 2. 631 (1937), perhaps as to description but the species not known from Chile and Peru. *Arenaria macrotheca* Hornem. ex Cham. & Schlecht. in Linnaea, i. 53 (1826). *Lepigonum macrothecum* Fisch. & Mey. Ind. Sem. Hort. Petrop. iii. 14 (1837), *nomen nudum*; Kindb. Synop. Lepig. 14 (1856). *Lepigonum macrothecum* (Hornem.) Kindb. Mon. Lepig. 16, t. i. fig. i. (1861); Wats. Bibl. Index (Smithson. Misc. Coll. 258), 103 (1878); Brewer & Watson in Geol. Survey of California, Botany, i. 71 (1876). *Spergularia rubra* sensu Torrey, Pacific R. R. Report, Botany, iv. 70 (1857), in part (Corte Madera coll. includes 2 plants, *S. macrotheca* and *S. media*; Martinez collection not found), non *Arenaria rubra* L. (1753); sensu

¹ I have never seen any absolutely white in the field but some labels state distinctly that the flowers are white. It is possible that the very light pink tinge was not noticed.

Torrey, Wilkes Explor. Exped. xvii., Botany, 247 (1874), in part at least (including the Lower Sacramento coll. the Puget Sound coll. not found), non *Arenaria rubra* L. (1753). *Tissa pallida* Greene ex Britton in Bull. Torr. Bot. Club, xvi. 126 (1889) (Monterey, *Meehan* coll. not seen); Greene, Man. Bot. San Francisc. Bay, 36 (1894). *Tissa macrotheca* (Hornem.) Britt. in Bull. Torr. Bot. Club, xvi. 129 (May 8, 1889); Brandeg. in Proc. Calif. Acad., Ser. 2, ii. 131 (Nov. 12, 1889), probably, though Socorro, Lower Calif. coll. not seen; Greene, Man. Bot. San Francisc. Bay, 35 (1894); Jepson, Fl. W. Mid. Calif. 169 (1901); Howell, Fl. Northwest Coast, 88 (1903); Piper, Contrib. U. S. Nat. Herb. xi. (Fl. State Wash.), 263 (1906); Piper and Beattie, Fl. Northwest Coast, 145 (1915). *Tissa macrotheca* var. *scariosa* Britt. in Bull. Torr. Bot. Club, xvi. 129 (1889); Jepson, Fl. W. Mid. Calif. 170 (1901). *Buda macrotheca* (Hornem.) Kuntze, Rev. Gen. 50 (1891). *Tissa Talinum* Greene in Erythea, i. 106 (1893). *Tissa valida* Greene in Erythea, i. 107 (1893). *Spergularia macrotheca* var. *scariosa* (Britt.) Robins. in Proc. Am. Acad. xxix. 313 (1894) and Synop. Fl. i. 253 (1897); Jepson, Fl. Calif. 493 (1914) and Man. Fl. Pl. Calif. 360 (1923). *Spergularia macrotheca* var. *Talinum* (Greene) Jepson, Fl. Calif. 493 (1914) and Man. Fl. Pl. Calif. 360 (1923); Munz, Fl. S. Calif. 164 (1935). *Alsine valida* (Greene) House in Am. Midl. Nat. vii. 134 (1921). *Alsine macrotheca* (Hornem.) House, l. c. *Alsine Greenei* House, l. c., renaming of *Tissa pallida* Greene.—NORTH AMERICA: along the Pacific Coast from northern Baja California to Vancouver Island, British Columbia. BAJA CALIFORNIA: San Quentin, *E. Palmer* 732, February, 1889 (U. S., G.); 23 miles south of Hamilton's Ranch, Santa Maria Plains, *Wiggins* 4537, March 23, 1930 (D. S.); Ensenada, *M. E. Jones*, April 11, 1882 (Pom.). Guadalupe Island, *E. Palmer* 864, March 29, 1889 (U. S., G., U. C., very thick, short, fleshy leaves); *E. Palmer* 864a, March 29, 1889 (U. S., Notre Dame, U. C., type collection of *Tissa Talinum* Greene, with short, glabrous, linear leaves); *Rose* 16027, March 2, 1911 (U. S., G., with glabrous linear leaves). CALIFORNIA: San Diego Co.: Oceanside, *S. B. Parish* 4451, June 11–16, 1897 (G., U. S.); sand dune strand, La Jolla, *F. E. & E. S. Clements*, March 14, 1914 (G.); sandy ocean beach, La Jolla, *L. F. Henderson* 13404, Jan. 31, 1931 (Ore.). Riverside Co.: alkaline marsh, Wildomar, *I. M. Johnston* 1872, April 27, 1918 (U. S., Pom.);¹ between Murietta and Temecula, *Munz* 2136, April 27, 1918 (Pom.).¹ Orange Co.: Newport Bay, *Lawrence M. Booth* 1062, May 19, 1932 (U. C., Pom.). Los Angeles Co.: moist ground of drying winter pool, mesa at north end of Baldwin Hills, Culver City, *Ewan* 7438, April 30, 1932 (U. C.); Ballona Harbor, *Abrams* 1223, April 1, 1901 (D. S., Pom.); east side of San Clemente Island, overhanging cliffs near the beach, *Nell Murbarger* 65, March, 1936 (U. C., with long lax stems and open inflorescence characteristic of *S. macrotheca*); sand dune, northwest coast, San Clemente Island, *Munz* 6608, April

¹ Even though on the coast, this collection has pink flowers and short styles.

8, 1923 (Pom., U. C., G., large fleshy plants with many-flowered, open inflorescence, seeds 0.6–0.7 mm. long); San Clemente Island, *M. E. Jones*, September 9, 1926 (Pom., inflorescence dense, erect habit approaching *Palmer* 864 from Guadalupe Island, seeds 0.6–0.9 mm. long); San Clemente Island, *Brandegee*, August 25, 1894 (U. C., 2 sheets, heavy, fleshy plants, one with inflorescence sharply differentiated and the other not, seeds 0.8 mm. long, habit approaching Guadalupe Island plants, such as *Palmer* 864a and 864); low ground near beach, Little Harbor, Santa Catalina Island, *M. B. Dunkle* 1910, April 29, 1928 (Pom.); seaside, Avalon, Santa Catalina Island, *Blanche Trask*, May, 1896 (U. S.); back beach flat, Emerald Bay, Santa Catalina Island, *M. B. Dunkle* 1815, April 9, 1928 (Pom.). Ventura Co.: frequent along seashore, San Nicolas Island, *Blanche Trask* 25, April, 1901 (G.); Santa Barbara Island, *Abrams & Wiggins* 312, July 3, 1931 (U. C., Cal. Acad., D. S.); on dry clay flat, Anacapa Island, *John T. Howell* 3803, May 19, 1928 (Cal. Acad.); along beach, Ventura, *Alice Eastwood* 5026, April 17, 1916 (Cal. Acad.). Santa Barbara Co.: sand dunes adjacent to Santa Barbara, *Eastwood*, May 30, 1909 (Cal. Acad.); deep sand of ravines between high dunes, Surf, *Grant, Ballou, & Ewan* 7921, May 30, 1933 (Pom.); Santa Cruz Island, *Greene*, July and August, 1886 (U. C., D. S.), type coll. of *Tissa valida* Greene; heavy soil in grassy places near ranch, Santa Rosa Island, *Munz & Crow* 11747, April 9, 1930 (Pom.); San Miguel Island, *Ralph Hoffmann*, June 11, 1930 (Cal. Acad.). San Luis Obispo Co.: roadside, Cayucos, *I. J. Condit*, June 14, 1911 (U. C.); along Morro Bay, *Eastwood* 18874, April 19, 1935 (Cal. Acad.); Roosevelt Highway n. of San Simeon, *Ynez Whitton Winblad*, June 17, 1937 (Cal. Acad.). Monterey Co.: Point Sur, *R. S. Ferris* 3701, April 22, 1923 (D. S.); Point Lobos, *Greene*, July 1, 1891 (U. S., W., D. S.); on maritime rocks, Cypress Point, Monterey, *A. Gray*, February–May, 1885 (G.,¹ low plants with short internodes); Pacific Grove, *Tidestrom*, June 6, 1893 (G., U. C., D. S., Pom.); Pacific Grove, *Elmer* 4387, June, 1903 (U. S., U. C., Pom., D. S., Ore.); Pacific Grove, *Gwendolyn Newell*, July 8, 1914 (G., Cal. Acad., seeds small, 0.6–0.7 mm. long, plants very lax and with long internodes); coast of Monterey, *J. D. Hooker and A. Gray*, Hayden's Survey of U. S. Territories, 1877 (G.,¹ lower internodes short but inflorescence open and high above). Santa Cruz Co.: ocean bluffs, Santa Cruz, *Lewis S. Rose* 35221, June 16, 1935 (Cal. Acad.). Santa Clara Co.: San Jose, *Mrs. E. A. Bush*, 1880 (U. S.). San Mateo Co.: in muddy clay at bottom of a small gully in high sea cliffs, 3 miles south of Half Moon Bay, *G. B. & R. P. Rossbach* 608, November 25, 1937 (G., D. S.,² lax, long-

¹ Cited under *Tissa macrotheca* var. *scariosa* by Britt. in Bull. Torr. Bot. Club, xvi. 129 (1889).

² These three collections were made at the same time within a few feet of each other and show characteristic plants of *S. macrotheca* and of var. *scariosa* (Britt.) Robins. with transition stages. It may be seen that sheltered plants grow lax and longer-leaved, while plants in exposed places become compressed mats with shorter

stemmed plants); forming hanging mats and cushions in soft sandy soil, face of sea cliffs, same locality, *G. B. & R. P. Rossbach* 609, November 25, 1937 (G., D. S.);¹ on top of sea cliffs of crumbling rock and sandy soil, same locality, *G. B. & R. P. Rossbach* 610, November 25, 1937 (G., D. S.,¹ part of the plants with *very* short internodes, making plants small and congested); Belmont, *Burt Dary* 809, April 17, 1893 (U. C.); mats on cliffs along coast, Montara Point, *Copeland* 3317, June 5, 1903 (U. S., G., Pom., U. C., determined as *Tissa pallida* by E. L. Greene). San Francisco Co.: bluffs near the sea, back of Lake Merced, *Greene*, June 9, 1887 (U. C., D. S., type collection of *Tissa pallida* Greene); saline soils, South San Francisco, *Stewart H. Burnham* 931, April 21, 1895 (Pom., both a long- and a short-internoded plant, the latter similar in habit to Guadalupe and San Clemente plants); Presidio, San Francisco, *Heller* 5700, June 12, 1902 (G., Pom., D. S., U. S.); near San Francisco, *J. Torrey* 41, 1865 (G., type collection of *Tissa macrotheca* var. *scariosa* Britt., with very short internodes); San Francisco, *K. Brandegee* June, 1890 (G., both short-internoded compressed and long-internoded lax plants in same collection); Farallone Island, *L. M. Loomis*, July, 1896 (U. C.). Contra Costa Co.: Point Richmond, *H. M. Hall* 1664, March 16, 1921 (U. C.). Alameda Co.: near Newark, *Burt Dary* 1110, May 6, 1895 (U. C., G.); Mt. Eden, *K. Brandegee*, May 14, 1893 (G., U. C.; Gray spec. marked *S. macrotheca* var. *leucantha*, a form with roseate petals, by B. L. Robinson for Syn. Fl. N. Amer.). Napa Co.: Napa River levee at Cuttings Wharf, *J. T. Howell* 10803, October 8, 1932 (Cal. Acad.). Marin Co.: Corte Madera, *J. M. Bigelow*, 1853-4 (G., U. S.,² only part of the collection, the other plant being *Spergularia media* (L.) C. Presl); along roadside at edge of salt marsh at Stinson Beach, *G. B. & R. P. Rossbach* 606, May 26, 1938 (G., D. S., U. C., U. S.); Point Reyes, *Burt Dary* 6773, June 18, 1900 (U. C., showing both lax, long-stemmed and matted, short-stemmed plants). Sonoma Co.: Bodega Point, *Eastwood* 4796, June 29, 1915 (U. S., G.); Bodega, *Katherine Brandegee*, June, 1905 (U. C.). Mendocino Co.: Mendocino, *H. E. Brown* 878, August, 1898 (G., U. S., a large cushion-forming plant with short internodes); Mendocino, *Jos. McMurphy* 39, July, 1903, (U. S., D. S., with long internodes). Humboldt Co.: plentiful in a salt flat between Eureka and Arcata, *Heller* 13780, July 9, 1923 (U. S., D. S.); Arcata, *M. E. Jones* 28873, July 16, 1931 (U. C., Pom.); salt marshes, Eureka,

leaves. This is true anywhere on the coast with similar variable habitats and therefore makes var. *scariosa* (Britt.) Robins. untenable.

¹ These three collections were made at the same time within a few feet of each other and show characteristic plants of *S. macrotheca* and of var. *scariosa* (Britt.) Robins. with transition stages. It may be seen that sheltered plants grow lax and longer-leaved, while plants in exposed places become compressed mats with shorter leaves. This is true anywhere on the coast with similar variable habitats and therefore makes var. *scariosa* (Britt.) Robins. untenable.

² Cited under *Spergularia rubra* by Torrey, Pacific R. R. Report., Botany iv. 70 (1857).

Eastwood & Howell 3782, July 3, 1936 (Cal. Acad., G.). Del Norte Co.: Castle Island, near Crescent City, *Mrs. G. Earle Kelly*, June, 1924 (Cal. Acad.). California without definite locality: Lower Sacramento, *Wilkes' Explor. Exped.* (U. S.);¹ from sands in California, but collected from Berlin Bot. Gard., *Schlechtendal*, 1825 (B. TYPE, fragment G., photo. of fragment D. S.).² OREGON: Curry Co.: tide-lands, mouth of Chetco River, *Henderson* 9988, June 4, 1929 (Ore., U. C.). Coös Co.: banks and thickets, Marshfield, *H. D. House* 4989, September 1, 1912 (U. S.). Lane Co.: salt marshes, Florence, *Henderson* 16506, August 7, 1934 (Ore.). Lincoln Co.: beach, Seal Rock, 10 mi. s. of Newport, *M. E. Peck* 7269, September 5, 1917 (G.); Yachats, *Sweetser*, August 30, 1909 (Ore.); moist cliffs along the coast, Yaquina Bay, *Henderson*, July 12, 1881 (Ore., seeds small, around 0.6 mm. long, but plant lax and long-internoded, characteristic of the species). Tillamook Co.: tide-flats of Tillamook Bay, Bay Ocean, *Henderson* 11549, July 31, 1929 (Ore.); salt marshes, Tillamook, *T. Howell*, July, 1882 (Ore.). WASHINGTON: Pacific Co.: in marsh, tide-flat, North Cove, *A. S. Forster* 826, July 26, 1908 (U. S.). Clallam Co.: high beach, mouth of Quillayute River, *I. C. Otis* 1557, July 31, 1927 (W.); moist ground on sandspit at Port Angeles, *J. W. Thompson* 7852, August 10, 1931 (U. S., G., D. S., seeds 0.6–0.7 mm. long). San Juan Co.: Argyle, San Juan Island, *S. M. & E. B. Zeller* 937, June 25–August 1, 1917 (U. S.); Kanaka Bay, San Juan Island, *Lucile Roush*, June 29, 1919 (D. S.). BRITISH COLUMBIA: vicinity of Victoria, Vancouver Island, *John Macoun* 12, August 13, 1893 (U. S.); Victoria, *John Macoun* 2781, June 18, 1887 (U. S.); rock-crevices, Gonzales Point, Victoria, *C. F. Newcombe*, July 21, 1919 (D. S., Newcombe); Java Rocks, Haro Strait, *W. A. Newcombe*, May 7, 1934 (D. S., Newcombe).

The habit of *S. macrotheca* varies from robust, long-noded, many-stemmed plants growing in rich, alkaline mud, to sprawling, slender, few-flowered ones inhibited by the crowding of other plants, or to short-stemmed, matted plants with crowded internodes, growing on cliffs exposed to sea-winds. This latter phase has been called var. *scariosa* by Britton and others, because of short internodes and heavy, glandular pubescence. More valuable diagnostic characters, such as

¹ Cited under *Spergularia rubra* by J. Torrey, *Wilkes. Explor. Exped. xvii., Botany*, 247 (1874).

² Cham. & Schlecht. in *Linnaea*, i. 53 (1826), published a previously inedited, botanical garden name of Hornemann for a plant growing in the Berlin Botanical Garden from seeds collected in sands of California by *Chamisso*. The plant in the Berlin Herbarium, a fragment of which is cited above, as in the Gray Herbarium, may then be taken as the type for *Arenaria macrotheca* Hornem., even though there should be a specimen at Leningrad where the chief collection of *Chamisso* is to be found (there is none in the first duplicate set in Berlin), the botanical garden plant would be the type because it was from that that the species was described.

seeds, stipules, flower- and fruit-measurements, all are the same as in more characteristic robust specimens of the species. In collecting almost anywhere on the cliffy shores of California, all stages in length of internode, size of plant and degree of pubescence may be found within a few feet of each other, one always finding that the scrubbiest plants grow in the most exposed places. Examples of this may be seen among the many collections from the Monterey peninsula, in collections made by the author at Half Moon Bay, San Mateo Co. (see note under citations), in the *Copeland* collection from Montara Point, San Mateo Co., among the many collections from San Francisco, and in the collection of *J. Burtt Dary* from Point Reyes, Marin Co. In addition, this compressed plant has no geographic range separate from that of the species.

Tissa pallida Greene was described: "plant stout, very light colored" and it grew on "bluffs near the sea, back of Lake Merced" near San Francisco. The plant has capsules fully mature, so perhaps it was past its prime and losing some of its fresh green color. The plant is also far from stout for this species but like the common form on the moist sea-bluffs where it hangs in dense mats. Therefore, since all the diagnostic measurements are the same as those of *S. macrotheca*, there is nothing to distinguish this plant from the species.

The type of *Tissa valida* Greene from Santa Cruz Island is a robust, glandular, heavily fruiting plant very characteristic of the common run of plants throughout the coast. There are no diagnostic characters making it different from the rest.

At first there seems reason for keeping *Tissa Talinum* Greene from Guadalupe Island, Mexico, as an entity because of its extremely short-internoded habit and crowded, spreading, fleshy leaves, with a leafless, strict inflorescence standing definitely above the foliage. Even though some of the Guadalupe Island plants have no match in habit anywhere else, there are plants there which do have some bracts in the inflorescence (*Howell* 8329) and do not have a strict inflorescence standing high above the foliage (*Palmer* 864). The leaves are very variable, being linear-filiform, nearly glabrous, 2-5 cm. long and 1 mm. wide, as often as very fleshy, densely glandular-pubescent, 1-2 cm. long and 3 mm. wide, with all stages between. One can scarcely use leaves as a diagnostic character. Guadalupe Island plants are always suffrutescent but so is the species often, throughout its range. This habit may be due to the drastic, desert

conditions upon the island. The seeds of Guadalupe plants measure 0.5–0.7 mm. long. Although the seeds of *S. macrotheca* are usually 0.7–0.9 mm., they are occasionally 0.6 mm. long, as in the following collections: Munz 6608, San Clemente Island; Newell, Pacific Grove; Thompson 7852, Port Angeles, Washington. All of these collections are plants with long internodes and characteristic habit of the larger specimens of the species, and do not suggest the habit of any of the Guadalupe Island plants. It is significant that the collection of Marcus E. Jones from San Clemente Island, 1926, which has a habit somewhat suggesting *T. Talinum* in its spreading, densely fascicled leaves and erect, crowded inflorescence, has seeds all the way from 0.6 to 0.9 mm. in length. The collections of T. S. Brandegee, 1894, from San Clemente Island approach in habit the Guadalupe Island plants of Palmer but have seeds about 0.8 mm. long. The measurements of stipules and styles and the number of stamens are the same as in *S. macrotheca*, while measurements of capsule and sepals are included within the range of variation of, although smaller than the average of the species. All these facts, showing that *Tissa Talinum* is not consistently distinct in any character, make its taxonomic standing very weak.

2. Var. LEUCANTHA (Greene) Robinson (PLATE 589, FIG. 1d and MAP 2). *Sepals* ovate-lanceolate, *never attenuate*, 4.5–7 mm., usually 5–6 mm. long; *petals white* or rarely pink-tinged,¹ 4.5–7 mm., usually 5–6 mm. long, usually equal to or sometimes as much as 1 mm. longer than or shorter than the calyx; *styles 1.2–1.8 mm. long*; *mature capsules 5.5–8 mm. long*, rarely equal to the calyx,² usually *exceeding it by as much as 0.5–3 mm.*; *seeds* same as in the typical variety except that all examined were winged or rarely rimmed, and often shining.—Robins. in Proc. Am. Acad. xxix. 313 (1894) & in Gray, Synop. Fl. i. 253 (1897); Jepson, Fl. Calif. 493 (1914) and Man. Fl. Pl. Calif. 360 (1923); Munz, Fl. S. Calif. 164 (1935). *Tissa leucantha* Greene, Pitt. i. 301 (1889) and Man. Bot. San Francisc. Bay, 36 (1894). *T. macrotheca* var. *leucantha* (Greene) Jepson, Fl. W. Mid. Calif. 170 (1901). *Alsine leucantha* (Greene) House in Am. Midl. Nat. vii. 134 (1921). *T. leucantha* var. *glabra* Davidson in Bull. S. Calif. Acad. Sci. xxv. 84 (1926). *S. macrotheca* var. *glabra* (Davids.) Munz, Fl. S. Calif. 164

¹ The following have pink-tinged flowers: Stockton, E. E. Stanford 838 (U. S.); 5 miles n. of Tulare, Abrams 12022 (Pom.); San Jacinto, Street & Durant (Pom.). Specimens of all these collections are in the Dudley Herbarium of Stanford University but there the flowers are either white or discolored brown. The lack of pink color is probably due to poisoning.

² To be seen in plant from half way between Kerman & Mendota, Fresno Co., Keck & Stockwell, 3350, in which the calyx is distinctly equal to the capsule.

(1935).—NORTH AMERICA: only in California, in low, alkaline places of the interior valleys from San Diego Co. north to Colusa Co. CALIFORNIA: San Diego Co.: Santa Maria, *Alderson* June, 1894 (U. C., G.). Riverside Co.: roadside in damp soil, San Jacinto, *Street & Durant*, May 12, 1918 (Pom., D. S.); vicinity of Perris, *H. M. Hall* 531, May 13, 1897 (U. C.). San Bernardino Co.: strongly alkaline soil, San Bernardino, *Feudge* 566, May 10, 1924 (Pom.); in alkaline soil, San Bernardino Valley, *S. B. Parish* 11719, April 13, 1918 (Cal. Acad.), same, April 20 (G.); vicinity of San Bernardino, *S. B. Parish* 4755, May 11, 1901 (D. S., Pom.). Los Angeles Co.: Studebaker, *Braunton* 307, May, 1902 (U. C., U. S.), in part;¹ near Dry Lake, Antelope Valley, *Burt Davy* 2256, May 9–24, 1896 (U. C.); alkaline flats with *Adelia neo-mexicana*, 5 miles west of Lancaster on Antelope Valley Road, *Ferris & Rossbach* 9479, May 13, 1938 (D. S., G., calyx pubescent); roadside, Lancaster, *Roxana S. Ferris* 916, June 12, 1918 (Cal. Acad., D. S.). Tulare Co.: Goshen, *K. Brandegee*, May 9, 1916 (U. C.); 5 miles north of Tulare, *Abrams* 12022, May 2, 1927 (Pom., D. S.); alkaline flats, Hanford, *Kearney* 19, June 10, 1907 (U. S.). Kern Co.: Dry Lakes, Mohave Desert, *Davidson* 3618, May, 1926 (Pom., D. S.), type collection of *Tissa leucantha* var. *glabra* Davidson. Fresno Co.: in alkali, on flood plains of San Joaquin River, half way between Kerman & Mendota, *Keck & Stockwell* 3350, May 17, 1935 (D. S., calyx equal to capsule). Merced Co.: alkaline plains, 10 mi. sw. of Merced, *J. T. Howell* 1465, May 2, 1926 (Cal. Acad.). San Joaquin Co.: Lathrop, *Greene*, April 30, 1889 (U. C., U. S.), TYPE COLLECTION of *Tissa leucantha* Greene. Contra Costa Co.: Antioch, *K. Brandegee*, May, 1893 (G.). Solano Co.: Vanden, *K. Brandegee*, April 30, 1893 (G.); Vanden, *Eastwood* September 20, 1893 (G.). Yolo Co.: between Woodland and Davis, *Abrams* 12601, May 8, 1928 (Pom., D. S.). Sutter Co.: edge of tule land, *Copeland* 8273, May 29, 1903 (Pom.), det. by Greene. Colusa Co.: near Willows, *Burt Davy* 4272, May, 1898 (U. C.); Colusa Junction, *K. Brandegee*, April, 1889 (G.).

This variety is easily distinguished from the typical form of the species by its longer stems and longer internodes, white flowers, usually more protruding capsule and somewhat longer style. It would be interesting to study flower-color in the field, for a few specimens in herbaria (see note above) seem to have pink flowers. Since flower-color may change in drying, it may be that flowers of the species are not always pink or rosy and that those of the variety are not always white.

Under *Tissa leucantha*, Greene cites three localities. The collection

¹ Both the species and var. *leucantha* were mounted on the same sheet. Since these were supposedly collected from the same place it is interesting to note that even where the two entities come together their diagnostic characters remain distinct.

from Lathrop is taken as the type. There are no *Greene* collections from Byron Springs and eastern Livermore Valley either at the University of California or the United States National Herbarium. These have not yet been located at Notre Dame but I venture to say that, because of the region from which they came, both the latter collections are probably of var. *longistyla*.

Var. *glabra* Davidson is characterized by being entirely glabrous. Careful examination of the type shows no other difference from the type or general collections of var. *leucantha*. The collection, *Ferris & Rossbach* 9479, taken not far from Davidson's type locality, however, shows pubescent calyces. I do not believe that a general absence of pubescence unsupported by other differences, even when the plants are all found in a given region, warrants their segregation as a variety.

3. Var. ***longistyla*** var. nov. (TAB. 589, FIG. 1e et 1f), sepalis ovato-lanceolatis, numquam attenuatis, 5.8–7 mm. longis; petalis albis, 5.8–7 mm. longis, sepala aequantibus vel eis 1 mm. longioribus vel brevioribus; stylis 3, ad basim divisiss, 2–3 mm. longis; capsulis maturis, 4.6–6 mm. longis, sepala aequantibus vel eis ad 1.8 mm. brevioribus; seminibus eis var. typicae similibus aliquando autem fere nigris et argenteis, plerumque lineis vermiformibus dense intertextis profunde sculptis, areolis inter sculpturam parvis tumulis crebris.— CALIFORNIA: only in central California. Alameda Co.: Niles, *M. E. Jones*, April 10, 1934 (U. C., Pom.); Livermore, *Michener & Bioletti*, April, 1892 (U. S., U. C.); eastern Livermore Valley, *J. T. Howell* 13739, April 10, 1938 (Cal. Acad., good flowers); alkaline marsh along roadside, 1.5 miles west of Altamont, *G. B. & R. P. Rossbach* 611, June 5, 1938 (G. TYPE, D. S., U. S., Cal. Acad., U. C., Pom., B., Ore., N. Y., F. M.); alkaline mud, roadside, 1 mile n. of Mountain House, half way between Altamont and Tracy, *G. B. & R. P. Rossbach* 613, June 5, 1938 (G., D. S., Cal. Acad.); alkaline marsh along roadside about 1.5 miles east of Altamont, *G. B. & R. P. Rossbach* 614, December 30, 1937 (G.). Contra Costa Co.: Byron Springs, *Burtt Davy*, May, 1898 (U. C.); Byron Springs, *Eastwood* 11667, April 28, 1923 (Cal. Acad.); near Martinez, *Burtt Davy*, 6659, June 7, 1900 (U. C.). Napa Co.: Calistoga, *Eastwood* 4639, June 5, 1915 (Cal. Acad., G., U. S.); Calistoga, *Eastwood*, May 7, 1900 (G.); Calistoga Geyser, *M. S. Baker* 2111a, May 1, 1927 (D. S.); damp adobe meadow opposite Myrtledale Geyser, 1.5 miles north of Calistoga, *Bucigalupi* 1254, March 27–28, 1926 (D. S., Pom.); plentiful in stiff adobe near one of hot springs at Calistoga in the blue oak belt, *Heller* 13849, April 12, 1924 (U. S., D. S.); Myrtledale Hot Springs near Calistoga, *J. T. Howell* 1759, March 27, 1926 (Cal. Acad., D. S.); Myrtledale Hot Springs, *Eastwood & J. T. Howell* 5518, May 15, 1938 (Cal. Acad.).¹ MAP 3.

¹ Tulare Co.: 15.7 miles north of Tulare, *F. R. Lawson* R. 62, April 5, 1930 (D. S.)

This variety is distinguished from var. *leucantha* by its longer style, sculptured seeds and never protruding capsule but is similar in lax, long-internoded habit and white flowers. It differs from the typical variety in having white flowers and much longer style. All three entities are similar in fasciculation of leaves, in stipules, and in size of seed.

S. macrotheca itself occasionally has deeply sculptured seeds and the seeds of var. *longistyla* may have the surface softly huddled and the sculpture only partially evident.

One plant¹ with pink flowers was found at the type locality. This had the capsule equal to and slightly exceeding the calyx, a short style 1.2 mm. long and smooth brown seeds with only delicate tracies and therefore is characteristic *S. macrotheca*.

4. *S. MEXICANA* Hemsl. (PLATE 589, FIGS. 4a-4c and MAP 4). *Suffrutescent perennial: tap-root fibrous-farinaceous, tapering gradually, often becoming 1 cm. thick: caudex* well developed, knotty, branched or unbranched, bearing many (often 20-25) diffuse stems, 3-15 cm. long; *internodes of stem below the inflorescence* slender, 3-20, usually 6-13 mm. long, 0.5-1 mm. in diameter: *leaves* not fascicled (but sometimes small, leafy branches in the axils), linear-filiform, glabrous, mucronate, 5-15 mm. long, 0.5-1 mm. wide: *stipules* inconspicuous, triangular-acuminate, scarious, 2-5 mm. long; *inflorescence* a lax cyme, 1.5-8 cm. long, with lower foliaceous *bracts* duplicating the vegetative leaves but becoming minute above, 2-5 mm. long, *internodes* glandular-pubescent, duplicating vegetative ones: *sepals* ovate-lanceolate, glabrous or with sparse, minute, glandular pubescence, scarious-margined, 2-4 mm. long; *petals* white, ovate, 1.2-2.4 mm. long; *stamens* 10; *styles* 3, 0.2-0.4 mm. long, dividing to base as the ovary matures: *mature capsules* 3-5 mm. long, exceeding calyx by 0.5-1.5 mm.: *fruiting pedicels* filiform, glandular-pubescent, often reflexed, the lower 2.5-10 mm. long; *seeds* brown, rounded in outline, somewhat sculptured in delicate, vermiform pattern, densely covered with large, glandular papillae which are often cup-shaped, 0.4-0.6 mm. long, not winged.—Hemsl. Diagn. Plant. Nov. pt. ii. 17 (1879) and Biol. Centr. Am. i. 72 (1879). *S. neglecta* sensu Hemsl. Biol. Centr. Am. i. 72 (1879), as to citation, Parry & Palmer 58, non *S. neglecta* Syme, Eng. Bot. ii. 129 (1864).²

has the style 3 mm. long and, though lacking mature capsules or seed, is probably var. *longistyla*, although all other collections in this vicinity have styles not over 1.8 mm. long and are var. *leucantha*. There is need of field investigation and mature specimens to check upon this locality.

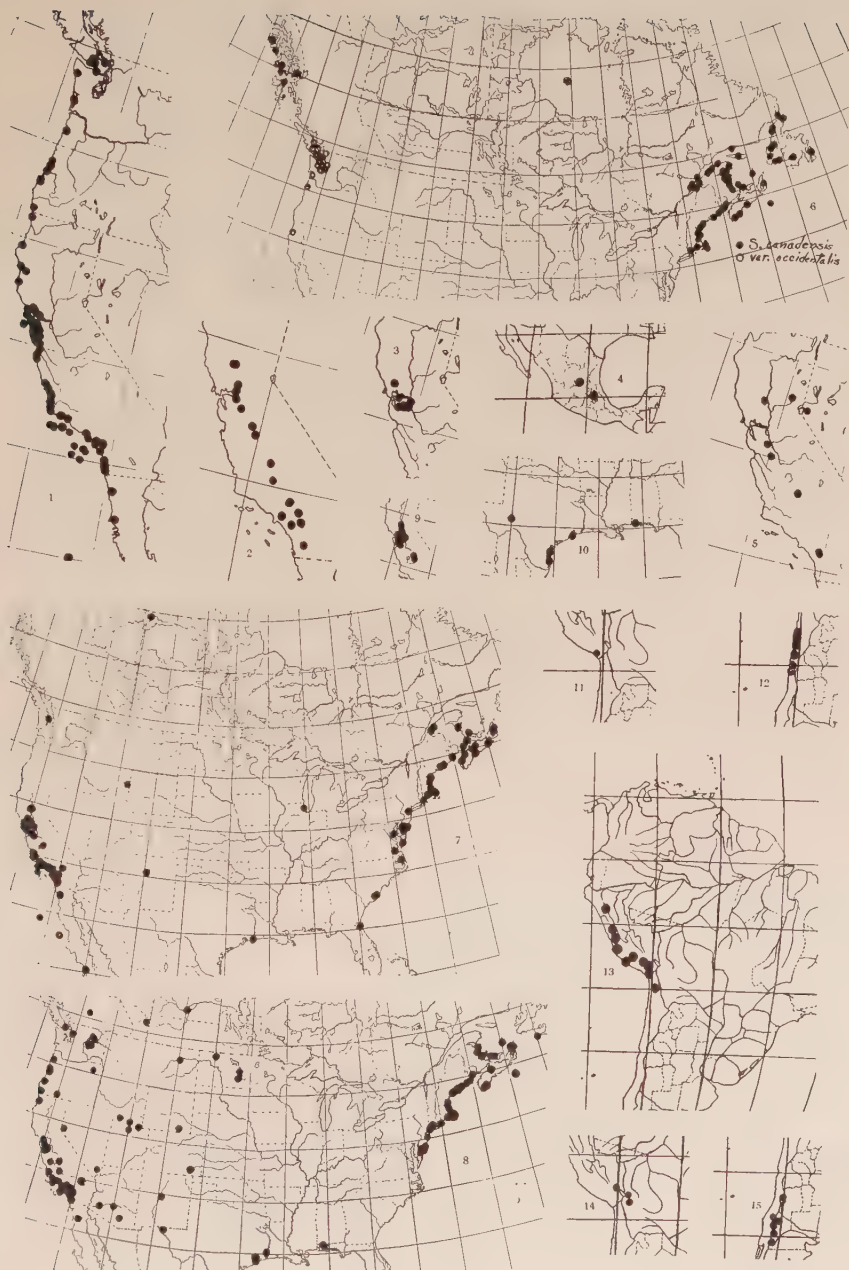
¹ 1.5 miles west of Altamont, Alameda Co., G. B. & R. P. Rossbach 612, June 5, 1938 (D. S.).

² Which has its source in *Lepigonum neglectum* Kindb., Syn. Lepig. 6 (1856). Later in Kindberg, Mon. Lepig. 37 (1863), *L. neglectum* was given as a synonym of *L. salinum* (J. & C. Presl) Fries, which in turn is a synonym of *Spergularia marina* (L.) Griseb.

Tissa mexicana (Hemsl.) Britton in Bull. Torr. Bot. Club xvi. 129 (1889). *Alsine mexicana* (Hemsl.) House in Am. Midl. Nat. vii. 134 (1921), not *A. mexicana* Bartl. ex Presl, Rel. Haenk. ii. 14 (1825), which is *Minuartia verna* (L.) Hiern fide Prof. Johann Matfeld in Fedde, Repert. Spec. Nov. Beihefte xv. 172 (1922). NORTH AMERICA: known only in Mexico in the states of San Luis Potosí and Hidalgo. MEXICO: SAN LUIS POTOSÍ: region of San Luis Potosí, alt. 6000-8000 ft., Parry & Palmer 52, 1878 (G., U. S.), type collection, TYPE at Kew, not seen; same data 58, 1878 (G.), type collection of *Spergularia neglecta* Hemsl., type at Kew, not seen; in sands around city, San Luis Potosí, Schaffner 137, 1876 (G.), 539, 1879 (U. S., Cal. Acad., B.). HIDALGO: bare hills above Pachuca, alt. 8500 ft., Pringle 6913, July 21, 1889 (G., U. S., B., W., U. C., Pom.).

5. *S. atrosperma*, spec. nov. (TAB. 589, FIG. 3a-3c). Annuæ: caulibus 1-8, erectis vel patentibus, 5-18 cm. longis: internodiis caulium partium effloriferarum gracilibus, glabris vel villosoglandulosis, 4-35 mm. longis, 0.5-1.0 mm. crassis; foliis linearibus, carnosius, glabris vel villosoglandulosis, mucronatis, non fasciculatis, 10-25 mm. longis, 0.5-1.2 mm. latis; stipulis late triangularibus, acuminatis, saepe paulo longioribus quam latis, 1.8-2.8 mm. longis: internodiis cymae filiformibus, glabris vel pubescenti-glandulosis, infimis 10-25 mm. longis: bracteis foliosis, supremis minimis; sepalis ovato-lanceolatis, glabris vel pubescenti-glandulosis, 2.8-4 mm. longis; petalis ovatis, albis vel roseis, 2-2.6 mm. longis; staminibus 4-8, saepe 1-2 abortivis vel ad basim connatis; stylis 0.5-0.8 mm. ad basim divisis: capsulis maturis 3.2-5 mm. longis, sepalis 0.6-1.4 mm. longioribus: pedicellis fructiferis reflexis vel non, filiformibus, plerumque pubescenti-glandulosis, aliquando glabris, 4-8 mm. longis: seminibus nigris, saepe iridescentibus,¹ lineis vermiformibus intertextis areolatis sculptis, saepe profunde sculptis, haud papillatis, 0.6-0.8 mm. longis, non alatis vel aliquando ala imperfecta parva fusca scariosa vel margine angusto nigro.—*Tissa diandra* sensu Britt. in Bull. Torr. Bot. Club, xvi. 128 (1889), in small part, including only the collection "Sierra Valley, Lemmon," the remaining collections being of true *S. diandra* and *S. echinosperma*, q. v.; sensu Greene, Fl. Francisc. 128 (1891), entirely as to plants discussed; non *Arenaria diandra* Guss. (1827). *Spergularia diandra* sensu Robins. in Proc. Am. Acad. xxix. 310 (1894), in small part, including only the collection "Goshen, Brandege," the remaining plants being *S. diandra* and *S. echinosperma*, q. v., non *Arenaria diandra* Guss. (1827).—NORTH AMERICA: only in alkaline places in California and adjacent Nevada. CALIFORNIA: Temecula, Riverside Co., M. E. Jones, April 24, 1882 (Pom.); dry mud-flat, ½ mile south of Lake Elsinore, Riverside Co., Munz 5075, April 29, 1922 (Pom.); plains, Tulare, Tulare Co., K. Brandege, April, 1889 (G.); Goshen, Tulare Co., K. Brandege, April, 1893 (G.); Los Banos Hills, Merced Co., J. T. Howell 13826, May 28, 1938 (Cal. Acad. TYPE,

¹ These seeds are black but often have an iridescent tinge over the black.



Ranges of, 1, *SPERGULARIA MACROTHECA* (typical); 2, *S. MACROTHECA* var. *LEUCANTHA*; 3, *S. MACROTHECA* var. *LONGISTYLA*; 4, *S. MEXICANA*; 5, *S. ATROSPERMA*; 6, *S. CANADENSIS* and var. *occidentalis*; 7, *S. MARINA* (with papillose seeds); 8, *S. MARINA* (with smooth seeds); 9, *S. MARINA* var. *TENUIS*; 10, *S. ECHINOSPERMA*; 11, *S. CONGESTIFOLIA* (also *S. COLLINA*); 12, *S. ARBUSCULA*; 13, *S. FASCICULATA*; 14, *S. ANDINA*; 15, *S. DEPAUPERATA*.

G., D. S., U. S., K., B.); clay soil, dried bed of former rain-pool, $7\frac{1}{2}$ miles sw. of Merced on Los Banos Road, San Joaquin Valley, Merced Co., J. T. Howell 4145, April 11, 1929 (Cal. Acad.); Merced Co., Mangst, May, 1886 (U. C.); moist alkali, south slope about 3 mi. up the canyon, Corral Hollow, San Joaquin Co., York, April 2, 1935 (D. S.); 4 miles east of Williams, alkali plains, Colusa Co., Roxana S. Ferris 509, April 12, 1917 (D. S.); Colusa Junction, Colusa Co., Brandegee, April, 1889 (G.); Sierra Valley, Sierra Co., Lemmon, June 22, 1874 (G.). NEVADA: alt. 5000 ft. south of Carson City, Ormsby Co., M. E. Jones, June 2, 1897 (U. S., Pom.). MAP 5.

S. atosperma differs from *S. diandra* in having larger seeds, which are more coarsely sculptured and have an iridescent tinge, longer stipules, and usually a slightly larger capsule. Otherwise the two species may be easily confused. Examination of many Old World specimens of *S. diandra* has convinced me that the seeds of *S. atosperma*, though similar, are too large to be included in the Old World species.

6. *S. DIANDRA* (Guss.) Boiss. (PLATE 589, FIGS. 5a-5c). Annual: with 2- ∞ slender, prostrate or diffuse stems, 5-15 cm. long: internodes of stem below the inflorescence slender, glandular-pubescent to nearly glabrous, 4-23 mm. long, 0.4-1.2 mm. in diameter; leaves linear, glandular-pubescent, shortly mucronate, 10-25 mm. long, 0.5-1 mm. wide; stipules small, deltoid, acuminate, often slightly longer than broad, 1-2 mm. long; internodes of inflorescence glandular-pubescent, the lowest 7-18 mm. long; bracts foliaceous, becoming minute above, 2-15 mm. long; sepals ovate-lanceolate, blunt-tipped, glandular-pubescent, 2.6-3.6 mm. long; petals rosy or white with pink toward the apices, ovate, 1.8-2.8 mm. long, as much as 0.5-1.2 mm. shorter than the calyx; stamens 4-7; styles 3, separated to the base, 0.4-0.6 mm. long; mature capsules almost globose, 2.6-4 mm. long, equal to or as much as 0.5 mm. longer than the calyx; fruiting pedicels filiform, glandular-pubescent, erect or spreading, 4-11 mm. long; seeds black with a silvery tinge, pyriform, usually sculptured in interwoven, vermiform pattern, so that there are narrow, short, molded ridges between, occasionally nearly smooth, sometimes with scattered, small, black papillae, 0.4-0.5 mm. long, not winged.—Fl. Orient. i. 733 (1867); Robins. in Proc. Am. Acad. xxix. 310 (1894), in part, including only the Oregon and Washington plants, excluding the California and Texan collections which are *S. atosperma* and *S. echinosperma* respectively. *Arenaria diandra* Guss. Prod. Sic. i. 515 (1827). *A. salsuginea* Bunge in Ledeb. Fl. Alt. ii. 163 (1830); Ledeb. Ic. Pl. Fl. Ross. Alt. Illus. v. t. 409 (1834), although no previous author cited. *Alsine diandra* (Guss.) Guss. Fl. Sic. Syn. i. 501 (1842); House in Am. Midl. Nat. vii. 134 (1921). *Spergularia salsuginea* (Bunge) Fenzl in Ledeb. Fl. Ross. ii. 166 (1844-46); Robins. in Gray, Synop. Fl. 251 (1897). *Lepigonum diandrum* (Guss.) Nym. Syll. Fl. Eur. 250

(1854-55); Kindb. Synop. Lepig. 7 (1856), as to source of name not as to plants described.¹ *L. salsugineum* (Bunge) Fisch. & Meyer, Ind. Sem. Hort. Petrop. i. 10 (1835); Kindb. Synop. Lepig. 7 (1856) and Mon. Lepig. 42. t. iii. fig. 30 (1863). *S. atheniensis* Heldr. & Sart. ex Nym. Consp. 123 (1878-1882), an herbarium name given as a synonym of *S. diandra* (Guss.) Boiss. *Tissa diandra* (Guss.) Britt. in Bull. Torr. Bot. Club, xvi. 128 (1889), in part, including only *Suksdorf* and *Henderson* collections, excluding the Californian and Texan collections; Brandegee, Proc. Calif. Acad. ser. 2. ii. 131 (1889), as to source of name, not as to plants discussed which are *S. marina*; Howell, Fl. Nw. Coast, 89 (1903), in part, including Columbia valley plants, excluding the Texan plants. *Buda diandra* (Guss.) Kuntze, Rev. Gen. 50 (1891). *S. salsuginea* var. *bracteata* Robins. in Gray, Synop. Fl. i. 251 (1897), in part, including the Oregon and Washington plants, excluding the Texan collections. *Tissa bracteata* (Robins.) Small, Fl. Se. U. S. 418 (1903), in part, including only the Washington plants, excluding the Californian and Texan collections. *T. diandra* var. *bracteata* (Robins.) Piper in Contrib. U. S. Nat. Herb. xi. (Fl. State Wash.) 264 (1906), in part, including the *Suksdorf* collections, excluding *Sandberg & Leiber* 346, which is *S. marina*; Piper & Beattie, Fl. Se. Wash. and Adjac. Idaho, 98 (1914). *S. bracteata* (Robins.) Nelson & Macbride in Bot. Gaz. lxi. 30 (1916); St. John, Fl. Se. Wash. and Adjac. Idaho, 144 (1937). *Alsine bracteata* (Robins.) House in Am. Midl. Nat. vii. 134 (1921).—NORTH AMERICA: introduced from the Old World² into Oregon, Washington, and Idaho in the Columbia and Snake River valleys; and perhaps locally in Massachusetts and Georgia. OREGON: roadsides, Oswego, Clackamas Co., *Howell*, June, 1888 (Ore.); muddy shore of Columbia River, on Hayden Island, opposite Vancouver, Wash., *J. C. Nelson* 2958, Oct. 11, 1919 (G.). WASHINGTON: sandy bank of the Columbia River, w. Klickitat Co., *Suksdorf* 176, September, 1883 (G.); same loc. and collector, 2082, October 18, November, 1891 (G., U. S., U. C.); sandy river bank, Bingen, w. Klickitat Co., *Suksdorf* 2082, September-November, 1904, April, 1891 (U. C., D. S., Ore.). IDAHO: gravel bars, alt. 3500 ft., Boulder Creek, Owyhee Co., *Macbride* 514, July 31, 1910 (G., U. S., D. S.).

The following specimens agree well but not exactly with the above plants. They are placed here for lack of thorough knowledge of Old World species to one of which they certainly must belong.

MASSACHUSETTS: Patuisset Island, Pocasset, Bourne, Barnstable Co., *J. A. Cushman* 8512, August 14, 1912 (New England Bot. Club). GEORGIA: Biltmore Herbarium, no collector, 1685a, Camden Co., March 29, 1902 (D. S., Pom.).

(To be continued)

¹ Later in 1863, *Kindberg*, Mon. Lepig. 35, refers this to *Lepigonum campestre* Kindb., which equals *S. Bocconi* (Scheele) Foucaud.

² Old World specimens from Spain, Greece, Tripoli, Morocco and Central Asia have been examined by the author.

CYPERUS POLYSTACHYOS VAR. FILICINUS

HUGH O'NEILL

IN RHODORA 19: 153 (1917), Fernald states he is unable to find any absolute character by which to separate *C. microdontus* specifically from *C. filicinus*. He further states that "occasionally colonies show scales intermediate in length and clearly bridging the gap between the two." Measurements made by the author on a large number of specimens from widely separated points in the range, confirm Fernald's conclusion.

In das Pflanzenreich 4²⁰: 37 (1936) Kükenthal writes of *C. microdontus*: "Mihi magis *C. fugaci* Liebm. sese appropinquare videtur, nullam veram differentiam video." He suggests calling *C. microdontus*: *Cyperus polystachyos* Rottb. var. *leptostachyus* Boeck. f. *fugax* Liebm.

A study of a considerable number of specimens indicates *C. filicinus* Vahl and *C. polystachyos* Rottb. as the extremes of a single continuous series of closely intergradient forms. The following table shows the impossibility of making any clear separation of *C. microdontus* from *C. polystachyos* var. *leptostachyus* Boeck., i. e. var. *texensis* (Torr.) Fern.

A single tuft often shows both subcapitate and open-umbellate inflorescence and other characters of intermediate nature, e. g. *Langlois*, Pass Christian, Miss., Oct. 1882; *Martindale*, St. Augustine, Fla.; *Curtis*, Jacksonville, Fla. 3049; *O'Neill* 8994, British Honduras; *Tharp* 1766, Texas; *Correll* 5781, Fla.; *Chapman*, Fla.

It therefore seems appropriate to include *C. microdontus* under *C. polystachyos* var. *texensis* and to regard *C. filicinus* as:

C. POLYSTACHYOS Rottb. var. **filicinus** (Vahl) comb. nov. *C. filicinus* Vahl, Enum. Pl. 2: 332. 1806. MAINE: *Moldenke* 6364. NEW HAMPSHIRE: Port Monmouth, *Dautun*. MASSACHUSETTS: *Seymour* 1090; Newburyport, *Steele*; *Bartlett* 1397, 1400; *Squantum*, *Davis*; Watertown, *Steele*; Boston, *Forbes*; *Blake* 9660; *Fernald* 32; *Moore* 3237; Monomoy Point, *Brainerd*; Nantucket, *Deane*. RHODE ISLAND: Providence, *Congdon*; *Blake* 3050; Portsmouth, *Fox*; *Fernald and Long* 8832. CONNECTICUT: Stratford, *Eames*; New Haven, *Kleeberger*; *Harger* 6979; New Haven, *Schallert*. NEW YORK: Flushing, L. I., *Hunt*; *Miller* 41; Ocean Beach, *Lighthipe*; Northville, *Young*. NEW JERSEY: Cape May, *Witte*; *Rugel*; *Holmes* 426; Atlantic City, *Wheeler*; Ocean City, *Bro. Arsène*; *Moldenke* 4010; *Redfield* 8571. PENNSYLVANIA: Philadelphia, Navy Yard, *Porter*. DELAWARE: *Larsen* 358. MARYLAND: Worcester County, *Shreve*; *Bartlett* 1855; *Redmond* 500; Rock Point, *Holm*; *O'Neill* 7194 and 7192; *Smith* 395.

TABLE 1

CYPERUS POLYSTACHYOS Rottb.

	Spikelets	Bract	Achene	Inf.	Glume	Rays
Fernald & Long. Pl. Ex. Gray. 321. Mass.	1.5 x 8	1	1.0 x 0.4	Subcap.	1.8 x 1.0	1
¹ Curtiss 3050, Fla.	1.5 x 22	3	1.1 x 0.4	U. C.	2.0 x 1.3	7
Cory 20454, Texas.	1.2 x 20	2	Unripe	Cap.	1.8 x 1.3	0
Seymour 7, Miss.	1.6 x 12	2	1.2 x 0.5	Subcap.	2.4 x 1.5	3
Reed, Duke 28885, N. C.	2.0 x 12	1	1.1 x 0.4	Subcap.	2.1 x 1.5	1
Moldenke 5270, Fla. (Same as Curtiss 3050) ...	1.8 x 30	3.5	1.1 x 0.4	Subcap.	2.0 x 1.2	0
O'Neill 7193, Md.	1.4 x 11	2	1.0 x 0.4	Subcap.	1.5 x 1.2	3
O'Neill 7204, Fla.	1.5 x 12	3	1.0 x 0.3	Umb.	1.5 x 1.1	5
(O'Neill 1067, 7206, 6233, 2597, 1123, 5089, 7205, 5257, 5258, 5259, 5260, 5261, 522 are all substantially the same as 7193 and 7204 and are all from Florida)						
Langlois, Bay St. Louis, Miss.	1.5 x 11	1	1.2 x 0.5	Subcap.	2.1 x 1.2	0
Mohr, Mobile 1897, Ala.	1.4 x 9	1	1.0 x 0.4	Subcap.	1.6 x 1.5	0
Uphof, Conway, Fla.	1.3 x 9	3	1.0 x 0.4	S. U.	1.8 x 1.2	3
² Wilson 487, Cuba.	1.2 x 18	2	1.0 x 0.3	Umbell.	1.8 x 1.5	8
³ Killip 4037, Panama	1 x 8	2 or 3	1.0 x 1.4	Spikes few	1.5 x 1.5	1
⁴ Curtiss 3049, Fla.	1.3 x 12	3	1.0 x 1.4	Umbell.	2.0 x 1.5	5
Nash 2494, Fla.	1.3 x 12	2	1.0 x 1.4	Subcap.	1.7 x 1.5	0
O'Neill 8993, Guatemala.	1.3 x 14	3	1.0 x 1.4	Subcap.	2.1 x 1.4	3
O'Neill 8995, British Honduras.	1.3 x 18	3	1.0 x 0.3	S. U.	2.1 x 1.3	6
Lundell 4740, Yucatan.	1.2 x 16	2	1.0 x 0.3	Cap.	2.0 x 1.3	0
Gentry 2045, Rio Mayo, Mexico.	1.5 x 18	2	1.2 x 0.5	Umbell.	2.0 x 1.2	4

¹ *C. polystachyos* var. *leptostachyus* f. *splendens* Kükenthal.² Cited by C. B. Clarke as *Pycnus polystachyos* Beauv. var. *laxiflora* Ridley.³ Determined by Standley as *C. fugax* Liebm.⁴ Cited as *C. polystachyos* var. *leptostachyus* Boeckl. by Kükenthal.

Legend: Subcap. = Subcapitate

U. C. = Umbellate and Capitate

S. U. = Subcapitate and Umbellate

NORTH CAROLINA: Elizabeth City, *Bro. Marcellus*. ALABAMA: Mobile, *Mohr*; Mobile Bay, *Mohr*. FLORIDA: *Curtiss* 5718, 4079; Jacksonville, *Hitchcock*. LOUISIANA: *Tracy et Lloyd*, Breton Island; St. Martinville, Pointe a la Hache, *Langlois*.

C. POLYSTACHYOS Rottb. var. TEXENSIS (Torr.) Fern. MASSACHUSETTS: *Fernald* 321; *Bacigalupi* 1910, 2127. MARYLAND: *O'Neill* 7193 and 9077; *Smith* 398. DISTRICT OF COLUMBIA: *Steele* 1896. VIRGINIA: *Heller* 1213. NORTH CAROLINA: Oak Island, Roxboro, 7228, White Lake, 33630A, *Blomquist*; *Oosting* 33593, 33753; *Correll*, 4856; Caswell County, Beaufort Co., Wake Co., Orange Co., Franklin Co., New Hanover Co., *Reed*. SOUTH CAROLINA: Frogmore, *Cuthbert*. GEORGIA: *Svenson* 7227; *Reade* E8049; *McVaugh* 61, 205; *Bartlett* 968, 1156. ALABAMA: St. Bernard, *Wolf*; Mobile, *Mohr*; Auburn, *Earle*. FLORIDA: *Correll*, 5582, 5593, 5635, 5722, 5781, 5783, 5809, 5862, 5872, 5873, 5898, 5934, 5891, 5944, 5951, 6080, 6302, 6338, 6364, 6424; *Leonard* 1123; *O'Neill* 2597, 5258, 5259, 5257, 5262, 5261, 7204, 7206, 1067; *Scott*, *Palatka*; *Tracy* 7005; *Curtiss* 3049, 4078, 5004; *Moldenke* 494, 588, 798, 1042, 5780; *Nash* 482, 1023, 2494; *Deam* 1927, 2754; *Eustis*, *Hitchcock*; Ft. Myers, *Standley*; *McFarlin* 4718; Winter Park, *Uphof*; Jacksonville, *Leeds*; *Rugel* 606; Tampa, *Ferguson*; Gainesville, *Chester*; Naples, *Rhodes*. ARKANSAS: *Heller* 4131. TENNESSEE: *Svenson* 4372. MISSISSIPPI: Horn Island, *Seymour*; Ocean Springs, *Macfarlane*; Biloxi, *Tracy*; *Seymour* 7. LOUISIANA: *Palmer* 8943; Pointe a la Hache, St. Martinville, *Langlois*. TEXAS: *Tharp* 1766, 4629, 1777, 3204, 3203, 9184, 3043; San Jacinto River, 2373, *Tharp*; Texarkana, *Letterman*; Galveston, *Fisher*; Crosby, *Fisher*; *Cory* 20317, 30318, 20454; *Young* 7; *Ottine*, 6264, *Bogusch*; *Hall* 676; *Reverchon* 2283A; *Palmer* 10630; Angelina Co., *Boon*. MEXICO: *Gentry* 2045, 2040; *Salitral* 1576; Vera Cruz, *Fisher*. CUBA: *Wilson* 487, 1282, 1663, 1546; *Baker* 2417, 3543, 3450; *Shafer* 125; *Van Hermann* 131. CENTRAL AMERICA: *Lundell* 4740, 5004, 7004; *O'Neill* 8993, 8994, 8995, 8992; *Gentle* 1934; *Schipp* 920. BRAZIL: *Martius* 18880. ARGENTINA: *Venturi* 7116.

LANGLOIS HERBARIUM

CATHOLIC UNIVERSITY OF AMERICA

FURTHER NOTES ON COASTAL FLORAL ELEMENTS IN THE BOGS OF AUGUSTA COUNTY, VIRGINIA

LLOYD G. CARR

UPON examining the flora in southeastern Augusta County on the west slope of the Blue Ridge, there is noted a distinct and characteristic coastal floral element in association with other interesting plants primarily of the uplands, which are also considered in the discussion.

The area affords varied habitats for the coastal species in its ponds, bogs, and grassy meadows.

The ponds are situated at an altitude of 1600 feet and represent filled-in limestone sinks that are fed by numerous springs. However, there is no outcropping of limestone here, for this is completely covered by sandy wash and talus at the foot of the Blue Ridge. The coastal species appear to be assembled around six general pond-centers with the exception of Magnolia Swamp—Blue Pond, Spring Pond, Lipscomb Pond, Mountain Lake (Shenandoah Acres), Green Pond, and Hattan's Pond regions. A marked difference is noted in the vegetative aspects of these regions.

Blue Pond has growing near its edge *Utricularia radiata* Small and several species of *Potamogeton*. Nearby there is an extensive meadow of *Woodwardia virginica* (L.) Smith and *Hypericum petiolatum* Walt.

Spring Pond lies in the heart of the flatwoods and is well hidden by the shrubby overgrowth on its edge. *Orontium aquaticum* L. is the predominant growth in the rather shallow expanse. *Utricularia geminiscapa* Benj. (*U. clandestina* Nutt.) adheres to the gelatinous stems of *Brasenia Schreberi* Gmel. *Utricularia gibba* L. is also present. Intermediate between the shrubby edge and the body of water are sphagnum hummocks on which grow *Panicum hemitomon* Schultes, *Scirpus subterminalis* Torr., *Eriocaulon septangulare* With., *Xyris torta* Sm. (*X. flexuosa* of the Manuals, not Muhl.), *Arethusa bulbosa* L., *Calopogon pulchellus* (Sw.) R. Br., and *Eupatorium verbenaeefolium* Michx. The shrubby edge contributes *Rhododendron viscosum* (L.) Torr., *Viburnum nudum* L. and *Gaylussacia dumosa* var. *Bigeloviana* Fernald. In nearby cranberry meadows are *Rhexia mariana* L., *R. virginica* L., *Sabatia gracilis* (Michx.) Salisb., *Solidago tenuifolia* Pursh, *Helenium virginicum* Blake, and *Panicum virgatum* L. *Spiranthes Beckii* Lindl. occurs here especially in sandy, rocky spots along the roads that are used for transporting wood from the mountains. *Lygodium palmatum* (Bernh.) Sw. climbs over *Benzoin aestivale* (L.) Nees along the mountain creeks.

Around Lipscomb Pond in the same general region there is an interesting find. *Solidago graminifolia* var. *polyccephala* Fernald occurs along a stream running from the pond in which grows *Utricularia radiata*. Lipscomb Pond is exposed, lying amid apple trees.

Mountain Lake (Shenandoah Acres) with its adjoining meadows contributes many significant plants to the coastal list. On its sandy

edge in five or six inches of water are *Ellecocharis melanocarpa* Torr., *Utricularia fibrosa* Walt., and *Xyris caroliniana* Walt. In the adjoining grassy and sedgy meadows appear *Calamagrostis cinnoides* (Muhl.) Barton, *Rhynchospora gracilentia* Gray, *Carex sterilis* Willd., *C. Mitchelliana* M. A. Curtis, *Juncus dichotomus* var. *platyphyllus* Wiegand, and *Juncus scirpoides* Lam. Throughout the meadows, amid cranberry vines *Habenaria lacera* (Michx.) R. Br., *H. ciliaris* (L.) R. Br., *Calopogon pulchellus*, *Aletris farinosa* L., and *Xyris torta* predominate. The shrubby aspects of the meadow are characterized by *Hypericum densiflorum* Pursh, *Prunus cuneata* Raf., and *Gaylussacia dumosa* var. *Bigeloviana*. In the dryer portions of the meadow, in white sand, *Desmodium sessilifolium* (Torr.) T. and G. appears, as a new record for the state. In similar habitats *Comandra umbellata* (L.) Nutt., *Rhexia mariana* and *R. virginica* are found.

Green Pond differs from the other regions in possessing an expanse of water that is totally covered with *Nymphaea advena* Ait. However, on the edge coastal species are represented by *Hibiscus palustris* L., *Lysimachia radicans* Hook., *Stachys hyssopifolia* Michx. and *Hypericum petiolatum*. Green Pond is hidden in the flatwoods by numerous oaks, persimmons, gums, and pines. In several semipermanent ponds, *Isoetes virginica* Pfeiffer, *Helenium virginicum* and *Juncus debilis* Gray are found.

The Hattan's Pond region comprises a much overgrown grassy, cranberry meadow. *Lachnanthes tinctoria* (Walt.) Ell. is here as a relic of a tropical family once widespread in Eastern U. S., but now confined to the coastal strip in the U. S. *Glyceria obtusa* (Muhl.) Trin. is a conspicuous grass in the meadow flora.

Magnolia Swamp affords great interest for the botanist in its varied floral elements. *Magnolia virginiana* L., *Ilex verticillata* (L.) Gray, and *Pinus rigida* Mill. are characteristic plants of the wooded portion. Beneath the arboreal growth *Helonias bullata* L., another member of a once widespread flora, is rooted in black muck. The meadow portion furnishes mucky soil permanently water-soaked, for *Scleria reticularis* var. *pubescens* Britton, *Carex Longii* Mackenz., *C. debilis* var. *pubera* Gray, *Sisyrinchium atlanticum* Bick., *Oenothera fruticosa* var. *vera* Hook., and *Xyris torta* and *Utricularia subulata* L. *Panicum longifolium* Torr. is an interesting representative of the coastal grass flora.

An explanation of the appearance of this coastal flora in the flat-

woods of the Blue Ridge and farther out in the valley province requires a survey of the physiographic history of the provinces concerned.

Since Cretaceous and early Tertiary time to the present the flat-woods of the Blue Ridge and the Shenandoah Valley proper have undergone cycles of erosion. Watson and Cline define four cycles of erosion. During Cretaceous times the entire Appalachian Upland was reduced to a peneplain (Kittatinny Cycle). An uplift of the Kittatinny Plain rejuvenated the stream and a second cycle of erosion was inaugurated in early Tertiary.

At the close of the Tertiary Cycle streams were rejuvenated by uplift of the region and a new cycle designated as the Shenandoah was begun, which resulted in the development of the Shenandoah plain in the valley limestone.

A third uplift of the region brought the Shenandoah cycle of erosion to a close, and thus was entered upon a new or recent cycle of erosion in early Pleistocene.

The presence of a widespread peneplain comprising the Appalachians during Cretaceous and early Tertiary times afforded conditions for a widespread flora that as yet had not been segregated into distinct categories correlated with provinces. Thus those species that are now termed coastal were widespread until subsequent uplifts brought about a change in the floral aspects of the Appalachian Uplands. The hydrophytic types accustomed to low, swampy, siliceous conditions were forced to retreat. But in certain regions of the Appalachians where grassy meadows, ponds, and bogs abound, coastal species exist as remnants of a widespread flora. Professor Fernald has graphically presented the residual idea in several of his recent papers. It appears significant to state some of his opinions here. "The Coastal Plain flora of Atlantic North America is distinguished by the abundance of tropical groups represented. Although these plants now chiefly occupy siliceous, peaty and aquatic habitats in comparatively youthful regions of eastern North America, it is probable that they or their progenitors formerly existed on the area of the ancient Appalachian Upland, especially in the Cretaceous, when that primitive region of the continent was base-leveled and reduced essentially to sea-level and at the time when the tropical groups of today were widespread in the North. Then with the Tertiary uplift of the Appalachian region and its final conversion into a vast well-drained mesophytic area

available to the groups which now constitute the climax forests of the Appalachian Upland, the Cretaceous xerophytes and hydrophytes which had previously occupied the ground gradually moved out to the newly available and for them more congenial Coastal Plain and similar habitats to the west and northwest."

So it appears that the physiographic features have been favorable for the maintenance of the now recognized coastal types that were once spread as a partially cosmopolitan flora during Cretaceous and Tertiary times.

SUMMARY OF SPECIES BY REGIONS

BLUE POND

UTRICULARIA RADIATA Small. Floating in water. Inflated petioles conspicuous. No. 129 (Gray Herb. and Va. Flora Herb., at U. Va.).

WOODWARDIA VIRGINICA (L.) Smith. Radiates from semipermanent ponds forming a very thick growth, so as to exclude other plants from its place of dominance.

HYPERICUM PETIOLATUM Walt. Moist sandy situations around semipermanent ponds that merge into meadow-like situations.

SPRING POND

ORONTIUM AQUATICUM L. Dominant throughout shallow expanse.

UTRICULARIA GEMINISCAPA Benj. (*U. clandestina* Nutt.). Floating and adhering to stems of *Brasenia Schreberi*. No. 382 (Gray Herbarium and Virginia Flora Herb., U. Va.); no. 316 (U. of Penn. Herb.).

BRASENIA SCHREBERI Gmel. Intermingled with *Orontium aquaticum*, near edge of pond. No. 24 (Va. Flora Herb., U. Va.).

UTRICULARIA GIBBA L. Attached to pieces of old logs, sphagnum and stems of other aquatics. No. 128 (Va. Flora Herb., U. Va.).

PANICUM HEMITOMON Schultes. Sphagnum situations, in slight abundance.

SCIRPUS SUBTERMINALIS Torr. Aquatic on edge of pond.

ERIOCAULON SEPTANGULARE With. Growing at varied depths from edge outward among *Potamogeton*. No. 21 (Gray Herbarium).

XYRIS TORTA Smith (*X. flexuosa* of the manuals, not Muhl.). Rooted in sphagnum hummocks.

ARETHUSA BULBOSA L. In peaty soil on edge of pond, ample shade. No. 54 (Va. Flora Herb., U. Va.).

CALOPOGON PULCHELLUS (Sw.) R. Br. In sphagnum. No. 61 (Va. Flora Herb., U. Va.).

EUPATORIUM VERBENAEFOLIUM Michx. In sphagnum hummocks bordering pond. No. 361 (Gray Herb. and Va. Flora Herb., U. Va.).

RHODODENDRON VISCOSUM (L.) Torr. Comprising shrubby growth on edge of pond.

VIBURNUM NUDUM L. Intermingled with *Rhododendron viscosum*. No. 407 (Va. Flora Herb., U. Va.); no. 408 (Gray Herb.).

GAYLUSSACIA DUMOSA var. BIGELOVIANA Fernald. Edge of pond. No. 138 (Va. Flora Herb., U. Va.).

RHEXIA MARIANA L. Moist swampy meadow in flatwoods. No. 11 (Gray Herbarium); no. 389 (Va. Flora Herb., U. Va.).

RHEXIA VIRGINICA L. Intermingled with the last species. No. 13 (Va. Flora Herb.).

SABATIA GRACILIS (Michx.) Salisb. Growing in meadows with *Rhexia*. No. 9 (Va. Flora Herb., U. Va.); no. 10 (Gray Herb.).

SOLIDAGO TENUIFOLIA Pursh. In grassy sandy meadows, inundated for a part of the year. No. 310 (Gray Herb.).

HELENIUM VIRGINICUM Blake. Type locality, growing in meadow with *Rhexia* and *Sabatia*. No. 139 (Gray Herb.).

PANICUM VIRGATUM L. Open meadows in flatwoods. No. 315 (U. of Penn.); no. 384 (Gray Herb.).

SPIRANTHES BECKII Lindl. On sandy banks and along woodland roads. No. 56 (Gray Herb.).

LYGODIUM PALMATUM (Bernh.) Sw. Climbing over shrubs along Kennedy Creek. No. 67 (Gray Herb.).

LIPSCOMB POND

SOLIDAGO GRAMINIFOLIA var. POLYCEPHALA Fern. Open territory near pond. No. 349 (Gray Herb.).

UTRICULARIA RADIATA Small. Floating in pond among *Potamogeton*.

MOUNTAIN LAKE (SHENANDOAH ACRES)

ELEOCHARIS MELANOCARPA Torr. Rooted to sandy edge of lake in five or six inches of water. Nos. 422, 436, 499 (Gray Herb.).

UTRICULARIA FIBROSA Walt. In association with the above species. No. 130 (Va. Flora Herb., U. Va.); no. 490 (Gray Herb.).

XYRIS CAROLINIANA Walt. On sandy edge of lake in sphagnum and in water. No. 293 (U. of Penn.); no. 398 (Gray Herb.).

CALAMAGROSTIS CINNOIDES (Muhl.) Barton. Growing from extensive areas of *Carex strictior* Dewey. No. 497 (Gray Herb.).

RYNCHOSPORA GRACILENTA Gray. Boggy meadows adjoining lake. No. 303 (Gray Herb. and U. of Penn.).

CAREX STERILIS Willd. Growing with the above species. No. 492 (Gray Herb.).

CAREX MITCHELLIANA M. A. Curtis. In boggy meadow. No. 350 (Va. Flora Herb., U. Va.).

JUNCUS DICHOTOMUS var. PLATYPHYLLUS Wiegand. With other sedges in grassy meadows. No. 403 (Gray Herb.).

JUNCUS SCIRPOIDES Lam. Growing in cranberry meadows. No. 500 (Gray Herb.).

HABENARIA LACERA (Michx.) R. Br. In moist situations with sedges.

HABENARIA CILIARIS (L.) R. Br. In moist sphagnum situations. No. 473 (Gray Herb.).

CALOPOGON PULCHELLUS (Sw.) R. Br. Abundant in meadows adjoining lake.

ALETRIS FARINOSA L. In drier parts of meadows. No. 234 (Va. Flora Herb., U. Va.).

XYRIS TORTA Sm. (*X. flexuosa* of the Manuals, not Muhl.). On edge of lake in sphagnum. No. 194 (Va. Flora Herb., U. Va.).

HYPERICUM DENSIFLORUM Pursh. In very moist spots in meadow. No. 499 (Gray Herb.).

PRUNUS CUNEATA Raf. A low shrub in dry portions of meadows. No. 282 (Va. Flora Herb., U. Va.); no. 358 (Gray Herb.).

GAYLUSSACIA DUMOSA var. BIGELOVIANA Fernald. In drier parts of sandy meadows. No. 409 (Gray Herb.).

DESMODIUM SESSILIFOLIUM (Torr.) T. and G. On edge of lake radiating into the drier spots of the adjoining territory. No. 345 (Va. Flora Herb., U. Va.); no. 168 (U. of Penn. Herb.).

COMANDRA UMBELLATA (L.) Nutt. In sandy soil. No. 498 (Gray Herb.).

RHEXIA MARIANA L. Edge of lake. No. 12 (Va. Flora Herb.).

RHEXIA VIRGINICA L. Edge of lake. No. 175 (Gray Herb.).

GREEN POND

NYMPHAEA ADVENA Ait. Occupying major portion of pond.

HIBISCUS PALUSTRIS L. (*H. Moscheutos* L.). On edge of pond. No. 136 (Va. Flora Herb., U. Va.); no. 292 (U. of Penn. Herb.); no. 362 (Gray Herb.).

LYSIMACHIA RADICANS Hook. In depressions near outlet. No. 360 (Gray Herb.).

STACHYS HYSSOPIFOLIA Michx. With the above species. No. 23 (Gray Herb.).

HYPERICUM PETIOLATUM Walt. Depressions on pond's edge. No. 291 (Gray Herb. and U. of Penn. Herb.).

ISOETES VIRGINICA Pfeiffer. Semipermanent ponds. No. 140 (Gray Herb.); no. 458 (Gray Herb.).

HELENIUM VIRGINICUM Blake. Semipermanent ponds with *Isoetes*. No. 309 (U. of Penn. Herb.).

JUNCUS DEBILIS Gray. With the *Isoetes*. No. 434 (Gray Herb.).

HATTAN'S POND

LACHNANTHES TINCTORIA (Walt.) Ell. In overgrown cranberry meadow. No. 20 (Gray Herb.); no. 294 (U. of Penn.).

GLYCERIA OBTUSA (Muhl.) Trin. With the Red Root. No. 314 (Gray Herb. and U. of Penn. Herb.).

MAGNOLIA SWAMP

MAGNOLIA VIRGINIANA L. Rather large inland colony. No. 99 (Gray Herb.); no. 146 (Va. Flora Herb., U. Va.).

ILEX VERTICILLATA (L.) Gray. Comprising a part of arboreal growth of the swamp. No. 115 (Va. Flora Herb., U. Va.).

HELONIAS BULLATA L. Growing in peaty soil below magnolias.

SCLERIA RETICULARIS var. *PUBESCENS* Britton. Occupying meadow portion of boggy spots. No. 451 (Gray Herb.); no. 304 (Gray Herb. and U. of Penn. Herb.).

CAREX DEBILIS var. *PUBERA* Gray. In boggy mire of meadow portion. No. 423 (Gray Herb.).

SISYRINCHIUM ATLANTICUM Bick. Intermingled with bog sedges. No. 428 (Gray Herb.).

CAREX LONGII Mack. In boggy meadow. No. 416 (Gray Herb.).

OENOTHERA FRUTICOSA var. *VERA* Hook. In sphagnum. No. 100 (Gray Herb.).

XYRIS TORTA Sm. In boggy meadow. No. 106 (Gray Herb.); no. 305 (U. of Penn. Herb.).

UTRICULARIA SUBULATA L. Beneath sedges rising from mucky level, slightly covered with water. No. 317 (U. of Penn. Herb.).

PANICUM LONGIFOLIUM Torr. In boggy areas. No. 455 (Gray Herb.).

ACKNOWLEDGEMENT

Appreciation is expressed to Dr. Ivey F. Lewis for suggestions and advice, and to Dr. John M. Fogg for assistance in determining the critical material. For the hospitality extended by Dr. and Mrs. Fogg during my stay at the University of Pennsylvania and the Philadelphia Academy of Science, I also express appreciation.

LITERATURE CITED

- CARR, LLOYD G. 1937. Some notes on the ecology of plants of Magnolia Swamp, Augusta County, Virginia. Virginia Academy of Science Proceedings, 1936-37.
- 1937. Utriculariaceae of Augusta County. *Claytonia* 4 (2): 23, 24.
- 1938. Coastal Plain plants in Southeastern Augusta County, Virginia, in the Valley and Blue Ridge Provinces. Virginia Academy of Science Proceedings, 1937-38.
- FERNALD, M. L. 1937. Local Plants of the Inner Coastal Plain of Southeastern Virginia. *RHODORA*, 39: Nos. 465-468.
- 1931. Specific Segregations and Identities in some Floras of Eastern North America and the Old World. *RHODORA*, 33: 25-63.
- WATSON, T. L. and CLINE, J. 1913. Drainage changes in Shenandoah Valley Region of Virginia. Philosophical Society, Univ. of Va., Scientific Series No. 1.

PENSYLVANICUS or PENNSYLVANICUS?—In recent years, in fact since Torrey and his successors, the specific epithet *pensylvanicus* (*a, um*) has been very generally spelled with two N's in the first syllable. This, of course, is in accord with the present spelling of the name of the state, Pennsylvania. Whenever, therefore, we go back to the original spelling of the specific epithet derived from that of the state, protests come in, for we have so long been accustomed to the liberties taken with original spellings by a great series of botanists that we are inclined to think the original spelling wrong and needing alteration. In 1917, in discussing *Polygonum pensylvanicum*, I wrote: "The specific name *pensylvanicum* was consistently so written by Linnaeus and by his contemporaries, but in most modern works it has been made to agree with modern geographic usage and written '*pennsylvanicum*,' apparently under the impression that an orthographic error is thus being corrected. Maps of the 18th century generally show the spelling *Pensylvania* so that it appears that Linnaeus, Lamarck and others who wrote the specific name with a single *n* in the first syllable were not committing an orthographic error but were following the authorized spelling of their day." (RHODORA, xix. 70.) Incidentally, of course, WILLIAM PEN or PENN used both spellings; Pepys, writing of him, used the first.

Since the protests continue to come in whenever one of these original spellings is taken up, it has seemed worth while to see whether a "standardized" spelling with the double N of recent usage is justified. The species in the flora of eastern North America which now have or which have recently borne the offending name are as follows. If in a half-hour's compilation I have overlooked a name its omission will not seriously change the conclusion. The original spelling alone is given.

1. ACER PENSYLVANICUM L. Sp. Pl. 1055 (1753).
2. ANEMONE PENSYLVANICA L. Mant. 247 (1771).
3. AVENA (now *Trisetum*) PENSYLVANICA L. Sp. Pl. 79 (1753).
4. CARDAMINE PENSYLVANICA Muhl. ex Willd. Sp. Pl. iii. 482 (1801).
5. CAREX PENSYLVANICA Lam. Encyc. iii. 388 (1789).
6. FRAXINUS PENNSYLVANICA Marsh. Arbust. 51 (1785).
7. MYRICA PENSYLVANICA or PENNSYLVANICA Loisel. in Nouv. Duhamel, ii. 190, t. 55 (1802), the first spelling validated by Chevalier, Mon. Myric. 182 (1901).
8. PARIETARIA PENSYLVANICA Muhl. ex Willd. Sp. Pl. iv. 955 (1806).
9. POLYGONUM PENSYLVANICUM L. Sp. Pl. 362 (1753).
10. POTAMOGETON PENSYLVANICUS Willd. ex Cham. & Schlecht. in Linnaea, ii. 227 (1827).

11. POTENTILLA PENNSYLVANICA L. Mant. i. 76 (1767).
12. PRUNUS PENNSYLVANICA L. f. Suppl. 252 (1781).
13. RANUNCULUS PENNSYLVANICUS L. f. Suppl. 272 (1781).
14. SAXIFRAGA PENNSYLVANICA L. Sp. Pl. 399 (1753).
15. SILENE PENNSYLVANICA Michx. Fl. Bor.-Am. i. 273 (1803).
16. VACCINIUM PENNSYLVANICUM Lam. Encycl. i. 74 (1783).

In 15 out of the 16 cases (only *Fraxinus pennsylvanica* diverging), it will be noted, only a single N was used; in other words, a current spelling of the period was followed. Those who appeal to have the spelling standardized would hardly change the specific epithet *upsaliensis* simply because it is the temporary or at least recent fashion to change the long familiar name Upsala to Uppsala. In two cases, *Myrica* and *Vaccinium*, the spelling *pensilvanica* (or *um*) was originally used, but these cases need not cause trouble. Loiseleur-Deslongchamps wavered between *Myrica pensylvanica* and *M. pensilvanica* and Chevalier, in his monograph of the group, selected (and thus validated) the more usual spelling. As to the *Vaccinium*, *V. Pensilvanicum* Lam. (1783) is antedated by *V. Pensylvanica* Mill. (1768) and, under existing rules, automatically goes into oblivion. The spelling *pensylvanicus*, as a maintained specific name, thus has right-of-way, except in the single case of *Fraxinus pennsylvanica* Marsh. Would those who want standardization wish to alter that?—M. L. FERNALD.

POTAMOGETON HILLII IN BERKSHIRE COUNTY, MASSACHUSETTS.—On July 30, 1939, I made a short excursion to a small pond at South Egremont, Massachusetts, and found great masses of the linear-leaved *Potamogeton Hillii* Morong growing in the slow streams which feed this most fascinating pool. Associated with it were the common *P. natans*, *Najas flexilis*, and a species of *Chara*. Both *Potamogetons* were fruiting heavily. This is the first Massachusetts record for *P. Hillii*, but by reason of its occurrence in neighboring Connecticut and New York, it was to be expected sooner or later in Berkshire County. Specimens, no. 1626 in my personal herbarium, have been sent to Gray Herbarium and are to be found in the herbarium at Iowa State College.—WILLIAM A. WEBER, Iowa State College, Ames, Iowa.

RAFINESQUE TYPES IN THE GROUP OF *ACALYPHA VIRGINICA*.—Undoubtedly the best set of Rafinesque specimens in existence is at Geneva. A letter of De Candolle, there preserved, states that he had received, at the time of writing, eight cases of dried plants from Rafinesque; and there may, of course, have been others. Apparently, De Candolle did not keep them in his own collection; at least, all the sheets of *Acalypha* I could find are in the Delessert Herbarium, where, through the kindness of Professor Hochreutiner, I was permitted, last summer, to search for such as might throw light on the identity of Rafinesque's species in the group of *A. virginica*, a revision of which I published in 1927.¹

The specimens found do not place all of Rafinesque's names, but, so far as they go, they are reassuring. There are five in all. They show that he applied the name *A. virginica* to *A. gracilens* Gray; one of his two sheets of that species is so labelled. Gray's name, therefore, is not threatened. There are two specimens of *A. rhomboidea*, labelled by Rafinesque himself with an epithet slightly different from *rhomboidea* as published, but with the same meaning, and quite certainly representing that species. One is from Arkansas, one from South Carolina. Both are small-leaved phases, and the former also has unusually long-stalked staminate spikes; but they can be matched in any considerable series of specimens and in technical characters both unquestionably belong with *A. virginica* var. α Muell. Arg., *A. rhomboidea* of my latest treatment. My use of the latter name is confirmed. I should designate the South Carolina specimen as type since it more nearly approximates the usual conditions in the species.

There is a third specimen, of large-leaved *A. rhomboidea*, named to genus only. This may represent *A. urticifolia* Raf. New Fl. i. 45 (1836). If so, it is not my *A. rhomboidea*, var. *Deamii*, as I had feared might be the case, and that name also stands clear.

There is nothing to represent either *A. digyneia*, which presumably rests wholly on Robin's description, or the three other North American species, which must remain of dubious identity.—C. A. WEATHERBY, Gray Herbarium.

¹ RHODORA, xxix. 193-204 (1927); also RHODORA, xl. 14-16 (1938).

Volume 42, no. 494, including pages 25-56 and plate 588, was issued 6 February, 1940.

NOTICE TO SUBSCRIBERS

Subscription revenue covers less than one-quarter the total cost of publication of RHODORA. The strictest economy is necessary to continue publication on the same scale as has obtained in recent years.

About one-third of our subscribers file their renewal orders through commercial subscription agencies which habitually deduct 10% from every remittance as a commission.

Many remittances reach the management in the form of drafts or checks which are subject to bank collection and exchange charges of varying amounts, owing to Clearing House rules.

For these reasons, the subscription rate to RHODORA has been set at \$2.00 *net* per annum payable in Boston or New York funds or their equivalent (i. e. drafts or postal money orders which are collectible in Boston at par). All subscription orders from agencies must be accompanied by remittances at the *net* rate without deduction. Hence all subscribers who require the convenience of agency service must regard the subscription rate to RHODORA as \$2.00, plus the charges of agents.

NOTICE TO CONTRIBUTORS

IN accordance with the Editorial Announcement of March, 1931, that RHODORA will follow the provision of the International Rules of Botanical Nomenclature, that the publication of names of new groups will be valid only when they are accompanied by a Latin diagnosis, contributors are notified to see that all new species or other groups proposed by them for publication in RHODORA have Latin diagnoses.

DUPLICATE BOOKS FOR SALE

- Barnes, C. R.** Analytic Keys to Genera and Species of North American Mosses. 1896. pp. 368. Rev. by F. De F. Heald.
Cloth **\$2.50**
- Beal, W. J.** Michigan Flora. A List of the Fern and Seed Plants Growing without Cultivation. (Reprint.) Lansing. 1904. \$.75
- Husnot, T.** Muscologia Gallica. 1884-1894. 2 vols. in 1. Plates 125 with 6000 fig. ½ l. binding. **\$7.50**
- Lesquereux, L. and James, T. P.** Manual of the Mosses of North America. 6 Plates. Cloth. Boston. 1884. **\$5.00**
- Nuttall, T.** An Introduction to Systematic and Physiological Botany. 1827. First Edition. 12 Plates. Original binding broken **\$1.00**
- Underwood, L. M.** Moulds, Mildews and Mushrooms. Frontispiece in Color and 9 Plates. New York. 1899. Cloth .. **\$1.00**

Prices include cost of transportation.

Address Librarian,
GRAY HERBARIUM of HARVARD UNIVERSITY,
Cambridge, Mass.

Early Volumes of Rhodora

A limited number of the earlier volumes can still be supplied. Libraries and other subscribers needing to complete their sets should communicate with LUDLOW GRISCOM, Museum of Comparative Zoology, Cambridge, Massachusetts.